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Nuclear Defense Laboratory Dedicates $4 Million Accelerator

Dedication of a $4 million Tandem Van de Graaff Accelerator, the only research tool of its kind within the U.S. Department of Defense, has expanded capabilities of the Army Nuclear Defense Laboratory (NDL), at Edgewood (Md.) Arsenal.

Maryland State Rep. Clarence D. Long gave the dedicatory address at Sept. 25 ceremonies which attracted a substantial gathering of top scientists representative of Department of Defense and other U.S. Government agencies. He was introduced by Brig Gen William W. Stone Jr., Army Materiel Command Acting Director of Research and Laboratories, a former CG of Edgewood Arsenal.

Dr. D.A. Bromley, professor of nuclear physics at Yale University, spoke as a representative of the academy community and Dr. W.W. Carter, Assistant Director of Nuclear Programs, Office of the Director of Defense Research and Engineering, spoke as the DoD representative.

Named in honor of the late Lt Col Ralph J. Truex, who was active in DoD nuclear research and development programs until his retirement in 1962, the new facility has been

(*Continued on page 3*)

AMC Announces Resignation of Top Administrators

Dr. R. G. H. Siu

Dr. J. T. Thomas

Brig Gen W. W. Stone Jr.

Resignation of two top scientific administrators of the Army Materiel Command—Dr. Jay Tol Thomas as Deputy for Research and Laboratories and Dr. Ralph G. H. Siu as Deputy Director of Developments and Engineering—were announced Sept. 18 by General Frank S. Besson.

The AMC commander also stated that Brig Gen William W. Stone Jr., assistant deputy to Dr. Thomas since September 1967, will continue in that capacity pending selection of a successor. General Stone has held a series of high-level R&D positions, starting as executive to the Director of Army Research in 1958.

Dr. Thomas will pursue advanced studies at George Washington University before returning to the teaching profession. Prior to 1960, when he began a distinguished career in industry with large companies, he

(*Continued on page 5*)

LCSS Electronic Equipment Deployed to 17 Installations

Land Combat Support System (LCSS), the first automatic electronic test equipment developed for in-the-field troubleshooting and repair of Army surface-to-surface missile systems, is now placed at 17 Army installations. Twelve are developmental models.

The first five systems limited production models were deployed in Sep-

(*Continued on page 6*)

Floating Power Plants Meet Emergency in Canal Zone

Emergency power requirements for operation of the Panama Canal, necessitated by the shipment of supplies to Vietnam and the increased traffic resulting from closing of the Suez Canal, are being served by two floating power plants developed by the Army Corps of Engineers.

First on the scene in response to a critical shortage of electrical power in the Canal Zone was the world's first nuclear floating power plant, the *Sturgis* barge with a 10,000-kilowatt capability. The *Sturgis* was moved from its final testing place at Fort Belvoir, Va., to Panama in August.

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Snead Succeeds Ostrom as Director of Army Research

Director of Army Research became Col (Brig Gen-designate) George Murrell Snead Jr.'s new title Sept. 30 when he succeeded Brig Gen Charles D. Y. Ostrom Jr., now commander of the U.S. Army Ordnance Center and commandant, Ordnance School, Aberdeen (Md.) Proving Ground.

Col Snead reported from an assignment as executive to the Assistant Chief of Staff, Communications-Electronics, Department of the Army. He had served in this capacity since January 1968, following a 2-year tour as director, U.S. Army Communications Automatic Data Processing Laboratory, Electronics Command, Fort Monmouth, N.J.

Graduated with distinction and a BS degree in electrical engineering from Virginia Military Institute in 1943, Col Snead received an MS

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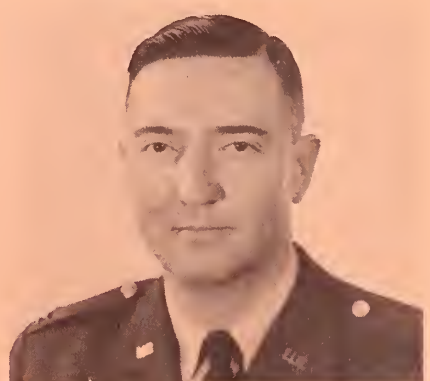

Col George M. Snead Jr.

Featured in This Issue . . .

Army R&D Newsmagazine

Vol. 9 No. 9 October 1968

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Associate Editor . . . . George J. Makuta

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Presidential Advisers, Consultants Meet at MICOM

Requirements and up-to-the-minute reports on how Army missile needs are being met were discussed when top scientific advisers to President Lyndon Johnson convened Sept. 18–19 for classified talks at HQ U.S. Army Missile Command, Redstone Arsenal, Ala.

Eight members of the President's Scientific Advisory Committee, Ground Warfare Panel, were accompanied by consultants and top Department of Army officials. They considered "Development Programs—Advanced Missile Systems, and Homing Guidance Systems for Missiles Against Surface Targets."

Maj Gen Charles W. Eifler, CG of the Missile Command, welcomed attendees. Dr. William C. McCorkle, director of the Advanced Systems Laboratory, Research and Development Directorate, was project officer.

Panel members included Dr. Sidney Drell, Stanford Linear Accelerator Center, chairman; Dr. Val L. Fitch, Palmer Physical Laboratory, Princeton University; Herbert K. Weiss, manager, Mission Analysis, Litton Systems, Inc.; Dr. Fredrik Zachariasen, director of physics, California Institute of Technology; Brig Gen Edmund L. Mueller (USA, Ret.) and

Dr. Byron P. Leonard, vice president, Aerospace Corp.; Dr. Charles P. Slichter, Department of Physics, University of Illinois; Dr. John D. Baldeschwieler, Department of Chemistry, Stanford University; Dr. Donald H. Steininger, executive secretary, Office of Science and Technology, Executive Office of the President.

Consultants included Dr. Kenneth L. Jordan Jr., Lincoln Laboratories, Massachusetts Institute of Technology; Dr. Frederick L. Keller, Aerospace Corp., and Dr. John J. Schwarz, Litton Systems, Inc.

Picatinny Engineer Receives 2 Degrees in One Day

Two master's degrees awarded on the same day, in physics and mathematics, with major honors in both, is the history-making accomplishment of Arnold Pallingston, a chemical engineer in the Nuclear Engineering Directorate at Picatinny Arsenal, Dover, N.J.

A search of the Fairleigh Dickinson University archives failed to disclose a similar achievement since the school was founded 25 years ago.

Pallingston attended evening classes almost six years at Fairleigh Dickinson while employed at the arsenal. The Nuclear Engineering Directorate where he works has Army Munitions Command responsibility for probing areas of unusual environmental changes brought on by electromagnetic disturbances and certain nuclear factors. He is a specialist in CBR ammunition.

Pallingston came to Picatinny in 1951 following graduation from City College, New York, N.Y., and began research in propellants. He was instrumental in encouraging the first use of an analog computer to determine the interior ballistic properties of propellants. Subsequently he worked in the Artillery Ammunition Lab and Pyrotechnics Lab.

In September, he began studies at New York University for a PhD degree in materials science, a field which deals with solid-state physics and with the basic behavior of electromagnetic and nuclear properties of materials.

Arnold Pallingston

Ballistics Instrumentation Lab Under Construction at APG

Construction of a $1.4 million Ballistics Instrumentation Laboratory was started recently at the Research and Development Center, Aberdeen Proving Ground, Md., with completion set for December 1969.

Under the auspices of the U.S. Army Ballistics Research Laboratories (BRL), the 2-story structure will provide 39,600 square feet of floor space for research, and house personnel now occupying BRL's Ballistic Measurement Laboratory.

The lab will provide facilities for the design and development of advanced methods of missile flight measurements, instrumentation systems, and research of techniques for obtaining basic data on environmental factors affecting weapons; also, for conducting basic studies in the theory of measurements and design of instrument systems for evaluation of weapons performance.

NDL Dedicates $4 Million Accelerator

(*Continued from page 1*)

transferred to the operational control of nearby Aberdeen (Md.) Proving Ground by the Materiel Command.

Col John C. Raaen Jr., commander of the APG R&D Center, announced earlier that Dr. Donald Eccleshall has been appointed as acting technical director of the NDL. Formerly scientist-in-charge of the Tandem Accelerator at Alder-Masten Research Center in England, Dr. Eccleshall has been serving as chief of the NDL accelerator division.

Under construction since July 1967, the NDL accelerator was built by the High Voltage Engineering Corp., of Burlington, Mass., and its shelter by Henry A. Knott, Inc., of Baltimore.

The facility will be used for conducting both basic and applied research and is capable of accelerating a wide range of nuclear particles to energies at which nuclear reactions can be studied with all the stable nuclear species.

In addition to the new Tandem Van de Graaff unit, the NDL has a Cockcroft-Walton Accelerator which produces beams of positive ions with energies up to 750,000 volts.

One of the accelerator's two exposure rooms is heavily shielded and the other of a minimal mass construction, for those programs where it will be desirable to reduce scattering to a minimum. The beam emitted is very well-defined and its energy can be controlled precisely yet varied over a wide range.

The NDL conducts research in nuclear weapons effects including initial radiation, residual radiation and fallout, shielding and thermal radiation phenomena. It is manned by 140 military and civilian personnel, of which more than 95 are scientists and engineers. Nuclear consultants from the academic community also participate in research at NDL.

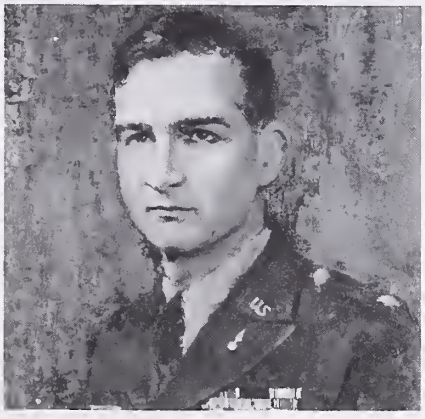
Although maintained primarily for the benefit of the Army, the Nuclear Defense Laboratory conducts many research projects for and in coordination with other Department of Defense and government agencies.

NDL traces its origin to a group of specialists from the Army Chemical Warfare Laboratories Protective Division at Edgewood Arsenal. The first task of this group, assembled in 1943, was to evaluate the protection afforded by Army Chemical Corps equipment against radioactive particles.

At that time special projects included tests to determine the efficiency of filter materials in removing radioactive aerosols from the atmosphere and the effectiveness of protective mask canisters in absorbing radioactive vapor.

The laboratory has participated actively in all U.S. atomic weapon tests, beginning with "Operation Greenhouse" at the Pacific Proving Grounds in 1951.

Early projects involved sampling and analysis of fallout, contamination and decontamination studies, gamma and neutron radiation shielding studies, evaluation of protective shelters, neutron flux and thermal radiation measurements.



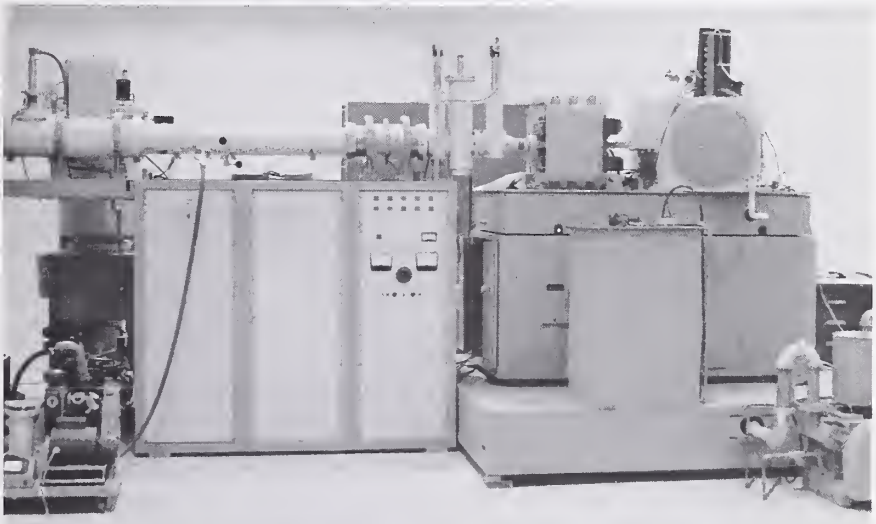
Lt Col Ralph J. Truex (portrait)

Dr. Donald Eccleshall

In addition to nuclear weapon test participation, an extensive laboratory program is conducted. Instruments such as fallout collectors, aerial survey devices, neutron and gamma detectors, air sampling and thermal radiation devices have been developed and evaluated at NDL.

From 1948 to 1960, NDL was known as the Radiological Division of the Edgewood Arsenal's Chemical Warfare Laboratories. In 1960, the laboratory was established as the Army Chemical Corps Nuclear Defense Laboratory, an independent command under the Chief Chemical Officer.

The NDL acquired its present name in 1962 and was placed directly under the U.S. Army Materiel Command when it was activated in the Army-wide reorganization.



NEGATIVE ION INJECTOR comprises the ion source and subsequent beam transport for the $4 million Tandem Van de Graaff Accelerator at NDL.

Sentinel Site Set for Boston Area

Construction of the nation's first Sentinel System ballistic missile defense site, oriented to the Chinese Communist threat, is planned in the Boston area and the U.S. Army is proceeding to acquire the site.

Congressional authorization has been obtained to acquire the land from private owners and the Commonweath of Massachusetts. The Army Corps of Engineers will construct Sentinel System facilities.

The Boston site is 22 miles north of the city near Sharpner's Pond, in North Andover Township, and the facility will accommodate a Perimeter Acquisition Radar (PAR). Associated with the PAR will be a Missile Site Radar (MSR) launching facility located at Camp Curtis Guild, a Massachusetts National Guard camp near Reading, 14 miles north of Boston.

Each of the facilities will require about 300 acres of land.

Floating Power Plants Meet CZ Emergency Needs

(*Continued from page 1*)

Latest addition is the *Andrew J. Weber,* a 21,000-kilowatt floating plant to provide precise electrical power for the U.S. Army's Kwajalein Test Range in the mid-Pacific Ocean. Not expected to be required at Kwajalein for about a year, the *Weber* will remain in the Panama Canal in the interim.

The *Sturgis,* a converted Liberty Ship, and its nuclear power source were developed by the Corps of Engineers, under its nuclear power program, specifically for such a situation as developed in the Panama Canal Zone—a floating power plant that could be moved anywhere in the world to meet an emergency power requirement. All members of the 67-man crew are graduates of a year-long Army nuclear power plant operators course.

The *Weber* is a converted surplus World War II U.S. Navy drydock, 240 feet long and 101 feet wide, designed and equipped under a $9 million contract to provide the precisely controlled power requirements for the Multifunction Array Radar II (MAR) that is being constructed on Kwajalein Island.

The Corps of Engineers is proceeding as rapidly as possible to provide an adequate permanent power source for operation of locks in the Panama Canal to accommodate the great increase in traffic. A $1,030,350 contract was awarded Sept. 11, 1968, to Delavel Turbine, Inc., Trenton, N.J., to design, produce and install a 33,000-kilowatt generator. The work will require about two years.

Plans are being developed for a new power plant building estimated to cost between $7 and $8 million. Work is expected to start in 1969 and be completed in 1971.

CE Conducting Course in Use of Water Resources

Intensive one-year training courses in wise use of the nation's water resources is a continuing program of the Army Corps of Engineers through its Board of Engineers for Rivers and Harbors.

Since 1961, when the program was initiated, 49 carefully selected engineers have graduated from the Water Resources Planning Associates Program. Twelve additional selectees started the course in September.

Purpose of the training is to accelerate the professional development of outstanding individuals for careers in national water resources planning and development.

Emphasis of the program over the years has shifted from the engineering-economic approach to include the sociological, environmental and aesthetic elements of planning, including consideration of non-traditional solutions to problems.

The program is conducted under direction of Col A. D. Wilder, resident member of the Board of Engineers for Rivers and Harbors, and Dean C. Pappas, chief of the Professional Development Division.

Students in this year's program are James D. Davidson, Huntington District; Charles E. Gilbert, North Central Division; Jacob Harari, San Francisco District; Earl Howard, Galveston District; Robert J. Kaighn, Philadelphia District; James A. Purdy, Pittsburgh District; Ralph D. Reid, Louisville District; Philip L. Rotert, Kansas City District; Gene N. Washburn, Little Rock District; William G. Wooley, Omaha District; Carroll E. Scroggins, Tulsa District; and Eugene W. Sikes, Charleston District.

Snead Succeeds Ostrom as Director of Army Research

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degree in communications engineering from the University of Illinois in 1948 and a PhD degree in physics from the University of Virginia in 1953. He is a graduate of the Command and General Staff College (1957) and National War College (1964).

Assigned to HQ U.S. Seventh Army in Europe in June 1964, he served as division signal officer and signal battalion commander, 24th Infantry Division, until July 1965. He then took command of the 505th (later 7th) Signal Group, Seventh Army in Europe.

Following a year of duty in Vietnam as signal adviser, he returned in August 1958 for assignment as assistant executive, Office of the Chief Signal Officer, Washington, D.C. In January 1960 he reported for duty with the Ballistic Missile Defense Program, Advanced Research Projects Agency. Eight months later he was assigned to the U.S. Army ADVENT (later SATCOM) Agency, Fort Monmouth, as chief, Systems Analysis Division until August 1963.

From August 1948 to June 1950 he commanded the Aleutian Sector, Alaska Communications System. After receiving his PhD degree he served a year as chief, Technical Requirements Division, U.S. Army Electronic Warfare Center, Fort Monmouth, and continued two years in the same capacity after the center was relocated at Fort Huachuca.

Col Snead has been awarded the Army Legion of Merit, Army Commendation Medal with four Oak Leaf Clusters, American Campaign Medal, EAME Campaign Medal with one star, National Defense Service Medal with OLC and various other military honors.

McBride Assigned as DCG Air Defense Systems, MICOM

Brig Gen George H. McBride, who has served nearly seven years of his Army career at Redstone Arsenal, Ala., recently succeeded Brig Gen Clarence C. Harvey Jr. as deputy commanding general of Air Defense Systems at the arsenal.

In earlier assignments he served as assistant director, Support Operations Division, Army Ballistic Missile Command (1956–57); deputy director, ABMA Training Division (1957–59); assistant commandant, Army Ordnance Guided Missile School (1963–64); Hawk project manager (1964–67).

Brig Gen George H. McBride

Until recently he was in Vietnam as CG of the U.S. Army Support Command at Da Nang, and earlier was deputy CG of the Army Aviation Materiel Command in St. Louis, Mo.

General McBride is a 1962 graduate of Auburn University with a BS degree in mechanical engineering. Among military schools, he has attended are the Air War College, Artillery School Guided Missile Course, and the Command and General Staff College.

His decorations include the Distinguished Service Medal, Legion of Merit with Oak Leaf Cluster, Air Medal with three Oak Leaf Clusters, and Army Commendation Medal with two Oak Leaf Clusters.

AMC Announces Resignation of Top Administrators

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was a department chairman and associate professor of physics and chemistry at Knox College. He also lectured at several leading U.S. universities.

Dr. Siu has been an Army scientist for 24 years who has achieved international acclaim and earned many high honors. He has accepted an appointment by President Lyndon Johnson as associate administrator of the new Law Enforcement Assistance Administration of the Department of Justice.

Dr. Siu also will establish and direct a new National Institute for Law Enforcement and Criminal Justice. In this respect he becomes the third Army scientist within the past 15 months to establish or direct a major U.S. Government R&D activity.

Dr. Edward M. Reilley, associated with Army R&D for 13 years, took over July 1, 1967, as the first director of U.S. Post Office Research and Development. Dr. Herbert L. Ley Jr. became Commissioner of the U.S. Food and Drug Administration July 1, 1968, after heading the FDA Bureau of Medicine. He was formerly with the Life Sciences Division, U.S. Army Research Office.

As director of the National Institute for Law Enforcement and Criminal Justice, subject to Senate confirmation of his appointment, Dr. Siu will have responsibilities across the broad spectrum of research and development related to law enforcement problems.

The institute will will be concerned with such matters as mass reaction and riot control, causes and prevention of juvenile delinquency, parole and rehabilitation of criminals to return them to respected roles, police education, special training, types of equipment, communications systems and improved management methods.

Established under the Anti-Crime and Safe Streets Act enacted by Congress in 1968, the Law Enforcement Assistance Administration is headed by Patrick J. Murphy (also subject to Senate confirmation). Until selected by President Johnson, he was Director of Public Safety for the City of Washington, D.C.

Another associate administrator of the agency, Wesley Pomeroy, former under sheriff of San Mateo County, Calif., will be responsible primarily for the grants program to assist states in improving crime control method.

Under the Anti-Crime and Safe Streets Act, the U.S. Government will provide funds to assist those states that conform to requirements for a well-developed plan to prevent crime and strengthen law enforcement agencies by education and training programs, developing new tactics and instituting preventive measures at the local level.

Dr. Siu was one of the Army nominees for a $10,000 Rockefeller Public Service Award in 1966, in recognition of long and distinguished public service. He was cited for numerous highly significant Army research achievements since his career with the Army Quartermaster Corps began in 1943. He first distinguished himself by research which produced effective methods of preventing mildew deterioration of millions of dollars worth of military materiel in the South Pacific in World War II.

One of the most notable public service contributions was his pioneering work in irradiation preservation of food from 1954 to 1964. This resulted in a citation stating in part that: ". . . At least four-fifths of the technical data known in the field today have directly or indirectly stemmed from the teams spawned off the project during his term as project leader."

Dr. Siu also served as chief editor of the first publication in the Army R&D Monograph series, *Radiation Preservation of Food*, which is still accepted throughout the world as a standard reference and the most comprehensive compendium in this field ever published.

Scientific achievements credited to Dr. Siu are too numerous to recount here in detail. In top management policies and procedures he has similarly distinguished himself. He was the only scientist appointed in 1960 to consider the reorganization of the Army effected in 1962.

Dr. Siu has been cited for an important part in instituting the Army R&D Achievement Awards, the Secretary of the Army Research and Study Fellowships Program and the Visiting Scientist Program (the latter involving an international exchange of research scientists).

When The Army Research Council (TARC) was established in 1964, he served as its first chairman. Out of several months of highly intensive effort by the Army's top scientists, including many called in as consultants, came the first 5-Year Army Research Plan, a massive document of several hundred pages.

Still it is as a humorist and philosopher that Dr. Siu has gained the most widespread public esteem. He is in continual demand as a guest speaker or master of ceremonies. Author of the "T-Thoughts" column that brightened the *Army R&D Newsmagazine* for several years, he also is known for writing several books that have been characterized by his wit, wisdom and knowledge of Chinese culture and philosphy. He is known as the "perennial chairman" of the Army Science Conference, having served in this role since 1957, except in 1966.

In a farewell tribute to his Army scientific colleagues, Dr. Siu said: "My career as an Army scientist has been rewarding beyond my greatest expectations. The Army R&D outfit is one of the best in the U.S. Government, in the entire world, in fact. Truly, they are a terrific group of people, exceptionally competent in their fields and extremely dedicated to their jobs."

Col Todd Assigned as ADFSC Deputy Commander

Col Robert G. Todd

Assignment of a new deputy commander of the Army Automatic Data Field Systems Command (ADFSC) was announced in mid-September.

Col Robert G. Todd, formerly personnel director of the U.S. Army Combat Developments Command, has assumed his new duties after several Armor and Artillery command and staff assignments before becoming a personnel specialist.

Graduated with a BA degree from Sophia University, he earned his master's degree in personnel management from George Washington University and is a 1966 graduate of the Industrial College of the Armed Forces.

ADFSC unifies the effort of elements of the Combat Developments Command and the Army Materiel Command engaged in developing transportable automatic data equipment for the Army's tactical troops.

LCSS Electronic Test Equipment Deployed to 17 Installations

LAND COMBAT SUPPORT SYSTEM is designed to test automatically components of Army missile systems. One shelter contains test equipment, the other serves as a repair area for the Shillelah, Lance, TOW and Dragon systems.

(*Continued from page 1*)

tember to Army field forces in the Continental U.S. and Alaska. One of the systems is being used at the U.S. Army Missile Center and School.

Intended to support initially the deadly Shillelagh missile system, the LCSS will be extended to other weapon systems, including Lance, TOW and the Dragon.

Developed for the U.S. Army Missile Command, headquartered at Redstone (Ala.) Arsenal, the LCSS was produced by the Aerospace Systems Division of RCA, Defense Electronics Products, Burlington, Mass.

MICOM's Land Combat Commodity Office has managed development of the LCSS. Designed primarily for field support, it also will be used at depot level. Seven of the 17 units delivered recently were developmental R&D models and 10 were deployed for Army field forces in the Continental U.S.

LCSS automatically detects and identifies malfunctions in the electronic and electro-optical guidance and control components of advanced weapons systems. It reduces from hours to minutes the average time required to pinpoint and correct the trouble and it is capable of independent operation in virtually any location.

In tests prior to delivery, the LCSS has spotted faults with better than 90 percent accuracy. The equipment is expected to make advanced weapons systems more effective by increasing assurance that they are always operationally ready. It reduces maintenance costs of these complex weapons by simplifying the testing process and by decreasing the number of spare parts that must be maintained.

The system consists of two shelters, both easily transportable by truck, aircraft or ship, and a power generator. One shelter contains the automatic testing equipment and the second is for repair of faulty units once the malfunction is identified.

In operation, a technician removes a unit suspected to be malfunctioning, connects it to the LCSS test set, and selects the procedure specified for testing that particular component. LCSS then prints out instructions as to the testing sequence which is then initiated and supervised by the technician.

Test and repair time with LCSS varies with complexity of the equipment under test and seriousness of the breakdown. It has been estimated that average time required to test a module, repair it and return it to service is approximately one hour.

LCSS reduces the length of training required for technicians since the process is automatically directed and controlled. Conventional testing techniques require more personnel trained in electronics.

Development of the Army's LCSS is the outgrowth of more than a decade of research on standardized automatic test equipment to support weapons and other military electronic equipment.

OCRD Announces Realignment of 2 Divisions

Redesignation of two divisional elements of the Office of the Chief of Research and Development, HQ Department of the Army, were announced in mid-September, one stemming from the report of a study group on organization, staffing and functions.

The Systems Analysis Division, formerly one of the four divisions of the Director of Plans and Programs, was transferred to the Director of Army Research and reconstituted as the Review and Evaluation Division.

The purpose of this action, it was explained, is to establish a closer working relationship with the Studies and Analyses Office of the Army Research Office, an element of the Directorate of Research. The Review and Evaluation Office remains located at the Pentagon.

The Scientific and Technical Information Division was redesignated the Data Management Division, in line with its expanding functions for the fiscal and management data aspects of the Army Research and Development Information System (ARDIS).

This action also involved redesignation of three of the four branches within the division. The Systems Research and Engineering Branch became the Systems and Programing Branch. The Programs and Concepts Branch was changed to the Information Programs Branch. The ADP Support Branch was renamed the Data Control and Scheduling Branch. The fourth division element is the Publications Branch.

Because of the close relationship that must exist between the Systems and Programing Branch and the Data Control and Scheduling Branch, they will operate as a unit, performing functions of the Technical and Management Information Center.

MERDC Develops New Adhesive For Runway, Field Camouflage

An experimental texturing adhesive for camouflage on airfield runways, missile pads and munitions loading areas is reported by the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

The high-molecular-weight epoxy material, mixed with sand, pumice, or other fine aggregate, shows strong resistance to jet blast and heat, tire abrasion and impact, and spilled fuels. It can be applied to the concrete or asphalt by roller, trowel, brush or spray.

Green or brown pigments are added for concealment purposes and the material has been tested successfully with yellow as a durable airstrip safety marker. A nonpigmented type is being tested for field camouflage. In this application, leaves, gravel, and twigs would be scattered over the adhesive to blend construction-scarred or other areas that might serve as landmarks into the surrounding terrain.

Brig Gen Charles D. Y. Ostrom Jr.

Brig Gen Thurston T. Paul

Brig Gen Donald D. Blackburn

Col Thomas N. Chavis

OCRD Announces Top Leadership Changes

Leadership changes in three of the four directorates of the Office of the Chief of Research and Development, Department of the Army, and reassignment of the executive are occurring within a one-month period.

Director of Army Research Brig Gen Charles D. Y. Ostrom Jr., who had held the position since February 1967, was the first to move to a new job. Effective Sept. 30, he assumed dual responsibility as commanding general of the U.S. Army Ordnance Center and commandant, Army Ordnance School, Aberdeen Proving Ground, Md.

Simultaneously Col (Brig Gen-designate) George M. Snead Jr. reported for duty as the new Director of Army Research. General Ostrom now fills the two positions held by Brig Gen Erwin M. Graham Jr. until he departed in June for assignment as CG of the U.S. Army Ammunition, Procurement and Supply Agency, Joliet, Ill.

Brig Gen Thurston T. Paul, OCRD Director of Plans and Programs since May 1966, retired Sept. 30 to end a 35-year career that led to many high-level assignments. From 1956 to 1960, he had key roles in the development and launching of Army missiles at Redstone, Arsenal, Ala.

Brig Gen Donald D. Blackburn has succeeded General Paul as Director of Plans and Programs, after serving since September 1967 as assistant commander of the 82d Airborne Division at Fort Bragg, N.C.

General Blackburn served in OCRD (1961–64) as deputy director, Developments (Special Warfare). He was then appointed director, Special Warfare, Office of the Deputy Chief of Staff for Operations, HQ DA, followed by duty in Vietnam as commander of the Special Operations Group, HQ MACV. His next assignment was assistant deputy director, U.S. Army Element, Communications Planning Group, Defense Agency.

Director of Missiles and Space Col Thomas N. Chavis will end 31 months of duty in OCRD when he retires Nov. 30 to end a 34-year Army career, the last 28 years on active duty. Assistant Director of Army Research and commander, Army Research Office from April 1966 until September 1967, he then became deputy director, Missiles and Space, until elevated to director in May 1968.

Col Nelson W. Tobey will succeed Col Chavis as head of the Missiles and Space Directorate. Serving presently as deputy director, he reported for duty in July 1967 as chief of the Air Defense and Missile Division. He served in OCRD (1957–60) with the Tactical Missiles Branch. (For biography, see July-August edition 1967, page 26.)

Col (Brig Gen-designate) Stewart C. Meyer, OCRD executive since June this year, departed Oct. 1 to succeed Brig Gen Allen M. Burdette as assistant to Deputy Director of Defense Research and Engineering (Tactical Warfare Programs). General Burdette's new assignment is assistant commander, 101st Airborne Division (Airmobile), U.S. Army Vietnam.

Col Meyer served with OCRD from June 1963 to February 1967 as assistant director, Plans and Programs, and was deputy director, Missiles and Space Directorate, until named OCRD executive.

Col John J. Doody, who was assigned to the OCRD Combat Materiel Division in August 1965 and appointed chief of the Test and Evaluation Branch, Management and Evaluation Division in September 1967, is the new deputy director of Programs and Budget Directorate. He is a 1948 graduate from the U.S. Military Academy and has a 1967 degree in business administration from George Washington University.

Lawrence Cohen was appointed to special assistant for management to the director Programs and Budget Directorate. A 20-year U.S. Civil Service employe, he joined the OCRD staff in 1961 as chief of the Budget Branch and in 1966 became deputy chief, Program and Budget Division. In his new position he provides consulting service and a point of contact in OCRD for field administrative management.

Col Nelson W. Tobey

Col Stewart C. Meyer

Col John W. Doody

Lawrence Cohen

Surgeon General Approves Award of 41 'A-Prefix' Certificates

Signifying the highest military medical professional attainment, "A-Prefix" certificates were awarded recently to six Army Medical Service Department officers in ceremonies at the Office of the Army's Surgeon General (OTSG), Washington, D.C.

Acting Deputy Surgeon General (Maj Gen) Philip W. Mallory presented the awards to Col Billy G. Greene, Col Jack W. McNamara, Col Mathew D. Parrish, Col Roland H. Shamburek, Col Ralph S. Singer, and Lt Col Wallace P. Murdoch.

The awards were among the first to be made to 41 Medical Corps, 9 Dental Corps, 7 Medical Service Corps, and 9 Nurse Corps officers approved by The Surgeon General. The total of 66 is the largest number ever selected in a single year for the A-Prefix.

TWO OF SIX Army Medical Service Corps officers who received "A-Prefix" certificates pose with Brig Gen William A. Hamrick (right), chief of the Army Medical Service Corps. At left are Col Billy G. Green and Lt Col Wallace P. Murdoch. Other recipients were not present when this picture was taken.

COL GREENE was honored for his distinguished work in optometry since 1961 as chief, Optometry Section, Walter Reed General Hospital (WRGH), and assistant chief, Army Medical Service Corps. He also served as optometry consultant to The Surgeon General.

Earlier assignments include chief of the Optometry Section, Schofield Barracks, Hawaii; consultant in occupational vision, U.S. Army Environmental Hygiene Agency, Edgewood, Md.; and chief optometry officer, Fort Jackson, S.C.

Col Greene was graduated from Southern College of Optometry, Memphis, Tenn., in 1949.

COL McNAMARA received the A-Prefix for his achievements in pharmacy. Prior to his present assignment as chief of the Pharmacy Consultant Branch, OTSG, he was chief, Pharmacy Service, Martin Army Hospital, Fort Benning, Ga.

Graduated from the University of Washington with a BS degree in pharmacy, he received an MBA degree from the University of Minnesota, entered the Army in 1943, and was commissioned in the Pharmacy Corps in 1945.

He has held various assignments as biochemist and pharmacy officer in Europe and at WRGH, as assistant professor of military science at the University of Minnesota, and as chief of Pharmacy Service, Brooke General Hospital, Fort Sam Houston, Tex.

COL PARRISH was awarded the A-Prefix for outstanding ability in the psychiatric field. Assigned recently as chief of the Psychiatry and Neurology Consultant Branch, Professional Services, OTSG, following a tour of duty with HQ U.S. Army Vietnam, he began his military career in 1941 and has served in the Aleutians, Japan, Korea and Germany. From 1965 to 1967, he was assigned to Walter Reed Army Institute of Research.

Col Parrish graduated from the University of Virginia and received an MD degree from George Washington University, Washington, D.C.

COL SHAMBUREK, chief of the Aviation Branch in the Directorate of Plans, Supply and Operations, OTSG, received the A-Prefix for his contributions in aviation medicine. His education includes BS and MD degrees from the University of Wisconsin and a master's degree from Harvard University School of Public Health.

Col Shamburek began his military career in 1954 and has been connected principally with aviation medicine, although he has served as medical officer and medical staff officer at various stateside and overseas posts.

WRGH Chief's ID Tag Idea Earns Suggestion Award

An idea for a change in the identification (ID) tag worn by everyone in U.S. military service has earned $1,500 for Col Billy G. Greene under the Army Incentive Awards Program, augmenting his recent receipt of the A-Prefix signifying the highest military medical professional level.

As chief of the Optometry Section, Walter Reed General Hospital, and optometry consultant in Professional Services in The Army Surgeon General's Office, Col Greene knew the time and cost involved in reexamining patients who lose eyeglasses or break them.

The complex problem of record keeping in a mobile Army and the requirement that a soldier keep his eyeglass prescription on his person at all times were equally well known to him. This knowledge prompted the ID tag change idea, despite the fact that eyeglass prescriptions are sometimes changed every two years, and ID tag data is permanent.

Metal ID tags, dangling from a soldier's neck sometimes are cold to the touch, often uncomfortable, and a hazard (noise-wise) when troops are on patrol. Col Greene suggested a plastic covering for the ID tags on which the soldier's eyeglass prescription could be imprinted.

With assistance from Dr. Fred Leonard, scientific director of the U.S. Army Medical Biomechanical Research Laboratory at nearby Forest Glen, Md., and technicians, a suitable material was found for the small envelope-shaped ID tag cover.

Col Green's idea has undergone evaluation tests in Alaska and Panama, resulting in a recent Army procurement order for four million plastic covers.

ID tag eyeglass prescription

He has served as Physical Standards officer and Aviation Medical officer on the staff of the USAREUR surgeon.

COL SINGER received the A-Prefix for his work as chief of the Communicable Disease Branch, Professional Services Directorate, OTSG. He holds an AB degree from Indiana University, an MD degree from Indiana University School of Medicine and master's degree in public health from Harvard University.

Col Singer began his service career in 1944, served with the U.S. Army Air Corps in Japan in 1946, and between 1947–51 completed his internship and residency at St. Francis Hospital, Colorado Springs, Colo.

Reentering the Army in 1951, he completed his training at Harvard University and was then assigned to the Far East as division preventive medicine officer, and medical staff officer with the 7th Infantry Division. Returning to the U.S. in 1954, he was assigned as medical staff officer, HQ U.S. Continental Army Command, Fort Monroe, Va.

After serving in the Preventive Medicine Division, OTSG, from 1960–62, he completed a tour of duty with the Seventh U.S. Army headquarters in Stuttgart, Germany, before returning to the OTSG in 1966.

LT COL MURDOCH was awarded the A-Prefix for achievements in entomology. He is with the Army Medical R&D Command, OTSG, following assignments as command entomologist and chief of the Environmental Health Division, Panama Canal Zone.

He received BS and MS degrees from Utah State University, and a PhD from the University of Utah. His military career began in 1951 and he completed the Basic Officer Orientation Course and the Preventive Medicine Officer Course at Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston.

He later commanded the 207th Preventive Medicine Survey Detachment in Korea, and from 1954–56 was chief of Entomology Division at the U.S. Environmental Hygiene Agency at Edgewood Arsenal. From 1957 to 1960, he was chief of the Department of Entomology at the 406th Medical General Laboratory, Japan.

A-Prefix awards were presented in separate ceremonies to Colonels Hinton J. Baker and Surindar N. Bhaskar.

Col Baker, special assistant to the director of the Armed Forces Institute of Pathology (AFIP), has been associated with the Walter Reed Army Medical Center (WRAMC) since 1957. He was chief, Department of Bacteriology, Walter Reed Army Institute of Research (WRAIR), and then CO of the U.S. Army Medical Research Unit, Malaya (1959–63).

From 1963 until July 1968 he served concurrently as special assistant to the WRAIR director, and assistant commandant and course director of the Military Medicine and Allied Sciences Course at WRAIR.

He also has served with the Army Surgical Research Unit at Fort Sam Houston, Tex., and was a coinvestigator of a chronic infections project at Harvard School of Public Health.

Col Baker received a BS degree from the University of Florida (1943), medical degree from Columbia (1945), and doctorate from Harvard (1959).

COL BHASKAR is chief of the Department of Dental and Oral Pathology, U.S. Army Institute of Dental Research (USAIDR). In addition, he serves as consultant in oral pathology to the chief of the Army Dental Corps, and as associate professor at Georgetown University Dental School.

Prior to his current assignment, he was chief, Department of Oral Pathology, WRAIR, and chief, Oral Tumors Branch, AFIP. He also has served as associate professor of pathology at University of Illinois Dental School.

Col Bhaskar earned his DDS in 1946 at Northwestern University, and his masters and doctoral degrees at the University of Illinois.

Dr. Bryson Named Scientific Director at ISA

Institute of Systems Analysis (ISA) scientific and technical planning is now under the direction of Dr. Marion Bryson, a statistician and operations research expert.

Dr. Bryson, 41, former Duke Medical School professor, will be ISA's principal contact with the scientific, professional and academic communities. He is also in charge of the assignment, conduct and approval of ISA technical study projects supporting the Combat Developments Command (CDC) Army development program.

While at Duke, Bryson taught and researched in the fields of mathematics, statistics and operations research. Early in his career he taught at the University of Idaho, Drake University and Iowa State University. He holds bachelor and master's degrees in mathematics from the University of Missouri and a PhD in statistics from Iowa State.

ISA gives CDC in-house technical support to insure that CDC's plans for Army development are practical and take full advantage of technology's advances. Bryson's appointment coincides with CDC's effort to provide top scientific advice to its commanders and promote constant contact with industry and technology.

During the past five years, Bryson has been program chairman and/or general chairman of the Army Operations Research Symposia. At Duke he worked with the Army Research Office-Durham under contract.

His activities in the military have included physical inventory accounting, inventory control, reliability theory, queuing theory, experimental design and mathematical models.

He has published technical articles in numerous American and British journals in the areas of operations research, medical statistics and sampling methods. He is a member of the American Statistical Association, the Institute of Mathematical Statistics, and the Operations Research Society of America.

Dr. Marion Bryson

Electron Microscopy Course Planned for AFIP, Dec. 2–6

An advanced course in electron microscopy will be held Dec. 2–6 at the Armed Forces Institute of Pathology, Washington, D.C., to provide intense instruction to a very limited number of individuals actively engaged in electron microscopy.

Course material will include stereologic analysis of sectioned material, autoradiography, quantitative electron microscopy, particle size analysis, considerations of high resolution, freeze etching, special staining techniques, and electron diffraction techniques.

Applicants must be members of the Medical, Dental, Veterinary or Medical Service Corps, or employed in the Federal Services. Qualified civilians will be accepted on a space available basis.

To apply, contact The Director, Armed Forces Institute of Pathology, ATTN: MEDEM-PAD, Washington, D.C. 20305.

World's Largest Balloon Reaches Record Height in Research Probe

White Sands (N. Mex.) Missile Range was the scene of the launching, on Sept. 11, of the world's largest balloon, carrying scientific instruments designed to collect data on the upper atmosphere.

Three and one-half hours after launch, the 587-foot-tall balloon was reported at 158,000 feet, establishing a new altitude record for free-floating balloons. The former mark was 150,000 feet. The destruct mechanism was triggered 18 hours later, after the vehicle was reported by researchers as having "provided a wealth of data not previously available."

Launch operations were conducted by the Air Force Cambridge Research Laboratory's balloon branch at Holloman Air Force Base, N. Mex., for the Atmospheric Sciences Research Office, an activity of the U.S. Army Electronics Command.

Despite the oscillating winds near the stratopause, telemetry equipment aboard the scientific package functioned perfectly. All sensors fed "legible" information to ground receiving stations in New Mexico and Arizona. Mobile ground meteorological detection stations, located along its float path, received the data.

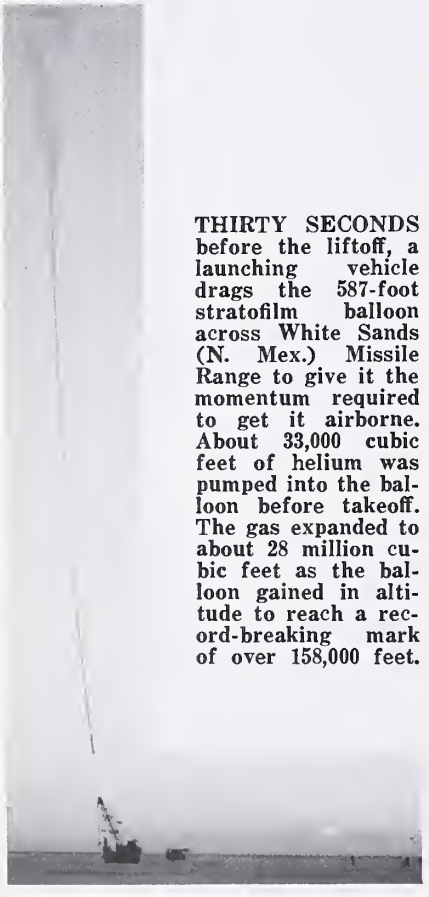
The balloon's initial rate of ascent was estimated at 1,000 feet per minute. As the vehicle gained altitude it passed successfully through two crucial stages. The first was at 35,000 to 50,000 feet, when it ascended through severe turbulence from the troposphere into the stratosphere. Thin air at the 100,000-foot level necessitated timely and accurate discharge of ballast.

The scientific payload, weighing 65 pounds, was described as a stable platform from which measurements of atmospheric density, ozone, temperature, pressure and humidity were taken. In addition the platform carried a cryogenic sampler, or pump, by which White Sands Missile Range scientists aimed to get a "relatively" large atmospheric sample.

The project provided the longest continuous measurement of the atmosphere to date at such high altitudes. Heretofore, rocket-borne sensors have been used to collect meteorological data at 2- to 4-hour intervals. Data collected will be used in conjunction with WSMR missile testing and are expected to have a wide application in other technical and scientific areas.

With a capacity for 28.6 million cubic feet of helium, the balloon exceeded the Voyager series capacity by more than 2-million cubic feet.

The Atmospheric Sciences Research Laboratory sponsored the project, which was codirected by Harold N. Ballard and Norman J. Beyers of the missile range office.



THIRTY SECONDS before the liftoff, a launching vehicle drags the 587-foot stratofilm balloon across White Sands (N. Mex.) Missile Range to give it the momentum required to get it airborne. About 33,000 cubic feet of helium was pumped into the balloon before takeoff. The gas expanded to about 28 million cubic feet as the balloon gained in altitude to reach a record-breaking mark of over 158,000 feet.

Army Demonstrates Helicopter Troop-Lifting System

Speedy lifting of troops from jungles and swamps by a new helicopter system was demonstrated impressively in early September at Sharpe Depot, Calif., in a showing of capabilities for scientists and officials of the Army Natick (Mass.) Laboratories.

Functional parameters of the system were conceived by the Natick Laboratories and developed under an Army contract by Aerostructures, Inc., of Menlo Park, Calif.

Using a CH–47 helicopter, the device should have the capability of lifting 20 infantry-men aboard in four minutes while the aircraft hovers 100 feet above the ground. The time compares with 40 minutes required to lift 20 infantrymen with the ladder system used in Vietnam.

Col James A. Bennett, director of the Natick Air Drop Engineering Laboratory, commented that the new high-speed escalator "significantly reduces the time a combat helicopter must sit as a motionless target."

The system showed a capability of lowering or retrieving combat troops, wounded soldiers and cargo at variable rates up to 10 feet a second. It can be installed in a CH–47 by the helicopter's crew in less than an hour by using existing fuselage hard points. A wheeled auxiliary power unit can be lifted aboard by one man.

"The system's 6,000-pound capacity," stated Robert Herda, vice president of engineering for Aerostructures, Inc., "is four times the loading rate of present systems and its speed is two to five times faster than single cycle winches. These rates do not take into account the continuous loop movement versus single cycle winching."

The system also includes a redundant pyrotechnic emergency jettison system with pilot-actuated control. Where trees canopies or other geographical features restrict access to narrow confines, the system can be used as a single line winch.

The system has been under development approximately one year. Performance specifications provide for a capability of lifting 16 wounded in litters within 15 minutes or moving 5,000 pounds of cargo in 200-pound bags within 10 minutes.

Jaycees Vote Picatinny Man National Outstanding Honor

Outstanding Young Man of the Year selection by the U.S. Jaycees (Junior Chamber of Commerce) is the distinction accorded to Don Shaw, a Picatinny Arsenal employe.

An electronics engineer at the Dover, N.J., Army installation, he was selected "as a complete surprise" on the basis of his "contributions to his profession, community and civic organizations."

Employed at Picatinny since 1954, Shaw earned a BS degree at Norwich University and a master's degree at New York University, both in electrical engineering. He has written numerous technical reports and has been granted a patent for a method of using explosives as an electrical switch. Last year he earned an outstanding performance award for his work with integrated circuits.

The long list of people who over the years have been judged Outstanding Young Men by the Jaycees and have later gained national prominence includes the late president John F. Kennedy, former football coach Bud Wilkinson, New York Governor Nelson Rockefeller, the late astronaut Virgil Grissom and Rudy Vallee.

Army R&D Complex Planned at Fort Belvoir

Plans for construction of an additional Army research and development complex at Fort Belvoir, Va., expected to provide employment to about 4,800 persons when completed in the 1985–90 time frame, gained conditional endorsement of the Fairfax County Planning Commission this past month.

The commission stipulated that the proposed plan be coordinated by the Department of the Army and the Military District of Washington with the Virginia State Highway Department if approved by the National Capital Planning Commission. The 455-acre proposed site, in the northwest corner of the 9,218-acre Army installation, is partially in the area of a projected highway.

Congressional approval of proposed funding is another hurdle to be surmounted over the projected 20-year development period, although some $5 million is reported available for beginning of work in 1970.

This sum is set aside for an office building for the Board of Engineers for Rivers and Harbors, now at Fort McNair, Washington, D.C., and the Coastal Research Center, Washington.

Long-range plans call for relocation of the U.S. Army Map Service, the Headquarters of the U.S. Army Combat Developments Command, now in several buildings at Fort Belvoir, and the Engineer Topographical Laboratories, also in scattered buildings at Belvoir and around Washington.

The Map Service is presently located within the Dalecarlia Preserve in Washington. The buildings would be torn down as a safeguard to water purity in the reservoir.

Approximately 1,400 of the eventual 8,000 employes envisioned for the new complex are employed presently by the four units scheduled to make the earliest moves. The Army has not disclosed what other R&D elements may be relocated in the complex or what the construction cost may be when work is completed.

TOPOCOM Consolidates Mapping, Geodetic Activities

Activation of the U.S. Army Topographic Command (TOPOCOM) has consolidated the Army Map Service (AMS), Engineer Topographic Laboratories (ETL) and mapping and geodetic staff elements of the Office of the Chief of Engineers.

Chief of Engineers Lt Gen William F. Cassidy announced that headquarters of TOPOCOM is located temporarily (until early 1969) in the T–7 Building, HQ OCE, and that Maj Gen Robert R. Ploger is acting CG. His regular assignment is director, Topography and Military Engineering, OCE.

TOPOCOM is charged with command and management of integrated resources to produce and distribute maps, geodetic data and other related topographic information to meet Department of Army and Department of Defense needs. Additional responsibilities include:

- Process and store topographic data on a worldwide basis to provide a state of readiness and quick reaction capability to support overseas topographic elements and to meet the tactical needs of Army and other DoD forces.
- Command and manage resources to execute research, development, testing and engineering in support of the Army and DoD topographic mission.
- Maintain the operational readiness and training of assigned military topographic units.
- Provide, on a worldwide basis, technical guidance and support to engineer units engaged in topographic activities.
- Provide specialized data for geographic and military hydrological studies and reports as required.

General Cassidy announced also that a topographic staff element has been established within the Office of the Assistant Chief of Staff for Intelligence to handle matters at General Staff level. Military and civilian personnel from AMS and OCE have been detailed to OACSI.

TOPOCOM Consolidates Mapping, Geodetic Activities

Maj Gen George H. Walker will take command of the Engineer Center and Fort Belvoir, Va., in November when Maj Gen Arthur W. Oberbeck becomes senior Army member, Weapons Systems Evaluation Group, Department of Defense.

General Walker was assistant commandant of the Engineer School at Fort Belvoir from August 1961 until May 1963, when he was assigned director of Topography and Military Engineering in the Office of the Chief of Engineers.

A 1937 graduate of the U.S. Military Academy, he has a master's degree in civil engineering from the University of California. He completed the Army War College course in 1955.

In recent years he has served as a staff officer on the War Department General District; executive engineer and engineer director, San Francisco District; executive and deputy to the Chief of Engineers for Civil Works; and engineer, I Corps, Korea.

During World War II he served in the Southwest Pacific as executive officer, 46th Engineer General Service Regiment, and in the European Theater as commander of the 103d Engineer Combat Group, Third Army.

Maj Gen George H. Walker

Tutorial, Research Papers Solicited for Displays Meet

Tutorial and research papers are being solicited for the Society for Information Displays Symposium scheduled May 27–29, 1969, in Arlington, Va. The theme of the symposium is M.E.D.I.A: (Man's Environments: Display Implications and Applications).

Halvor T. Darracott, acting chief of the Operations Analysis Division, Advanced Materiel Concepts Agency, Army Materiel Command, has been named chairman to receive the papers. Five draft copies and five copies of a 100 to 150-word abstract must be submitted to him by Dec. 15, addressed to the agency at 3220 Duke Street, Alexandria, Va. 22314.

The papers should identify specific aspects of man's environments in which information displays can "produce vital benefits . . . immediately and in decades to come through intelligent and imaginative applications of technology."

Typographical Error Corrected

The lead article on page 1 of the September 1968 edition of this publication, titled "ARPA-Sponsored Study Probes Research 'Coupling' Problem," was guilty of a $99 million error, by substituting b for m in million.

In discussing a proposal to establish a Center for Advanced Studies in Invention and Innovation, Dr. Arthur A. Ezra, chairman of the Department of Mechanical Sciences and Environmental Engineering, University of Denver, estimated annual "steady-state basic funding of a million" would be required. The figure appeared in the article as a billion.

This typographical error is regretted by the editorial staff.

Navy, Marine Corps Add Officers to Mallard Staff

All four U.S. military services now have full-time resident representatives on the Mallard Project staff at Fort Monmouth, N.J., following addition of Cmdr Raymond Hoffman of the U.S. Navy and Lt Col Howard R. Henn of the Marine Corps.

Maj Gen Paul A. Feyereisen is U.S. program-project manager and Army representative, and Col David S. Woods is the U.S. Air Force senior representative. The Mallard Project is a joint effort of the United States, United Kingdom, Canada and Australia to develop an international tactical communications system:

BRIGADIER Harry Roper (left) will become United Kingdom program-project manager of the Mallard Project late this month. He will replace Brigadier Ronald G. Miller (right), who is retiring from active duty after 34 years of service. Brigadier Roper will divide his time between the Ministry of Technology in London, and Fort Monmouth, N.J., where the United Kingdom maintains a full-time resident staff for the tactical communications program being carried out in cooperation with the U.S., Canada and Australia.

CMDR HOFFMAN was assigned to the Mallard Project following a tour of duty on the staff of the commander of Allied Naval Forces, Southern Europe. Other assignments have included liaison duty with the U.S. Army Strategic Communications Command, and with the Office of the Director of Naval Communications. In Southeast Asia, he served with aircraft carrier service forces, amphibious staffs and destroyers.

COL HENN recently ended three years in the Office of the Chief, Communications-Electronics, HQ U.S. Marine Corps, serving primarily as coordinator of the Canadian-United Kingdom-United States Combined Communications Board. He is a veteran of World War II and has served in Korea and Japan.

The Mallard Project was ratified in April 1967. The original objective was to meet field army requirements for a secure, digital automatically switched communications systems in the 1975–77 period.

The concept, however, provided for participation by other services of the partner countries. Project planning is now directed toward producing a true interservice as well as an international system for tactical elements of the four nations.

MALLARD U.S. PROJECT-MANAGER Maj Gen Paul A. Feyereisen welcomes Marine Corps representative Lt Col Howard R. Henn and Navy representative Cmdr Raymond Hoffman to the international tactical communications staff.

USACDC Plans Light Armor Battalion, Vehicle Tests

Extensive 3-phase troop testing of the newly organized Light Armor Battalion and its new M551 Armored Reconnaissance Airborne Assault Vehicle has been scheduled by the U.S. Army Combat Developments Command, Fort Belvoir, Va.

The 6-week trials will begin Nov. 1 at Fort Riley, Kans., and conclude Dec. 16 to determine feasibility and test doctrine and techniques for employment of the organization.

Movement testing, air deployment, and firing and armament evaluations will be made. Throughout the tests, the logistic and maintenance requirements of the M551 vehicle will be studied. The 1st Battalion, 63d Armor of the 24th Infantry Division, presently stationed at Fort Riley and equipped with the M551, will be the test unit:

The 16-ton M551, a versatile addition to the Army's armored vehicle inventory, is lightweight, amphibious and highly mobile. It can be air-transported and air-dropped. The vehicle mounts a combination gun/launcher with the dual capability of firing conventional ammunition or the Shillelagh guided missile.

First-phase testing at Fort Riley will examine the unit in a simulated conventional, nonnuclear warfare. Tests will portray U.S. Forces engaged in a war with a mechanized threat similar to that found in Western Europe.

During the second phase, one company will be air-transported to Fort Stewart, Ga., where environment will provide a setting similar to Southeast Asia. The situation will simulate U.S. Forces deployed by air to an underdeveloped nation which has requested ground forces assistance to help combat insurgency.

The final phase will concentrate on the platoon, while evaluating the firepower and maintainability of the M551. Firing exercises at Fort Riley will be used to gather information on the weapons, ammunition, fire control system, maintainability and employment of the platoon.

Brig Gen Linton S. Boatwright, CG of Fort Riley and the 24th Infantry Division, is the test director. He will be assisted by Col George E. Kimball, the deputy test director from the Armor School at Fort Knox, Ky. Lt Col Louis C. Wagner is CO of the 1st Battalion, 63d Armor.

ECOM Authors Acclaimed for Paper

Participants in the fall meeting of the National Committee of the International Scientific Radio Union, held at Northeastern University in Boston, acclaimed a technical paper titled "Topside Ionospheric Structure at Northern Latitudes and Ground Sunset in Summer."

The paper was coauthored by Dr. Paul R. Arendt and Haim Soicher, both assigned to Division C of the Institute for Exploratory Research, U.S. Army Electronics Command, Fort Monmouth, N.J.

Margetis Takes USAIDR Helm; Oestereich Directs USAMBRL

Director of the U.S. Army Institute of Dental Research at Walter Reed Army Medical Center became the new title of Col Peter M. Margetis this past month.

Since July 1963, he has served as director of the U.S. Army Medical Biomechanical Research Laboratory (USAMBRL) at the Forest Glen Section of Walter Reed Army Medical Center. He was succeeded at USAMBRL by Lt Col Orlyn C. Oestereich.

A graduate of the University of Wisconsin, Col Margetis entered active military service in 1943, after earning his doctor of dental surgery degree from Marquette University.

He served with the 91st General Hospital in Europe during World War II, and was Division Dental Surgeon with the 24th Infantry in Korea during the conflict. He has had two duty tours at Fort Riley, Kans., the last as chief of the Hospital Dental Clinic from 1952 to 1953. He then served for three years in the Dental Materials Research Section of the National Bureau of Standards while attending Georgetown University where, in 1956, he was awarded his master's degree in materials and biochemistry.

Col Margetis is a consultant to the Specifications Committee of the International Association for Dental Research, Army Liaison representative to the National Institutes of Health Dental Study Section, president of the Washington Section of the International Association of Dental Research and a member of its executive committee, Dental Materials Group. He is also a member of the American Dental Association and a Fellow in the American College of Dentists.

Col Peter M. Margetis

Lt Col Orlyn C. Oestereich

LT COL OESTEREICH is serving his third assignment at Walter Reed, where he was assistant troop commander of the Forest Glenn (Md.) Section from 1953 to 1956. He served a full tour at the USAMBRL prior to assignment to Vietnam in 1965.

Then he attended the Medical Field Service School at Fort Sam Houston, Tex., and after graduating was assigned as executive officer of the U.S. Army Medical Unit at Fort Detrick, Md. He has a BS degree in military science from the University of Maryland and has completed the Army's hospital administration course at Baylor University.

APG Redesignates D&PS to Materiel Test Directorate

Redesignation of Development and Proof Services at Aberdeen (Md.) Proving Ground (APG) as the Materiel Test Directorate (MTD) was announced in mid-August by Col George C. Clowes, APG commander.

Reorganization of the new MTD is basically functional. Headed by a director and an associate director, the commodity-type divisions are Artillery, Automotive, Electronics and General Equipment, Infantry and Aircraft Weapons, and Supporting Services.

Col Clowes said the redesignation does not affect the internal organizational structure, although several headquarters units have been regrouped and redesignated, as follows:

Adjutant Office to Administrative Division, Control Office (Equal Opportunity) to Deputy Equal Employment Office, Intelligence Office to Intelligence Division, Safety Office to Safety Division, Technical Support Directorate to Supply and Maintenance Directorate, Communications and Electronics Division to C&E Directorate, and Engineering Support Services Division to Facilities Management Directorate.

Under various titles, the Materiel Test Directorate dates back to the establishment of Aberdeen Proving Ground in 1918, at which time the unit was one of APG's major activities. Today, nearly 1,350 scientists, engineers and support personnel comprise the MTD.

As a principal test facility for the U.S. Army Test and Evaluation Command, the MTD no longer devotes its attention exclusively to ordnance items, but tests and proofs all materiel as assigned by USATECOM.

MICOM Laser Expert Earns Doctorate at Oxford

Dr. William B. McKnight, a U.S. Army Missile Command physicist, recently returned from two years study in Oxford, England, where he was awarded his doctorate in physics. His thesis was "Studies of Stimulated Emission from Molecules," a report on basic research on lasers.

Dr. McKnight is chief of the Applied Physics Branch, Physical Sciences Laboratory, Research and Development Directorate. This branch develops and adapts lasers and laser devices for application to guided and ballistic missiles.

He assisted in the initial experiments and designed the laser that the Missile Command turned over the U.S. National Institutes of Health. Featuring an articulated arm with an ability to project a laser beam through the arm, it permits control of the pulse of the laser with respect to intensity, frequency and direction of energy.

Dr. William B. McKnight

Dr. McKnight came to Redstone Arsenal and the Missile Command in 1953 from the U.S. Navy Underwater Sound Reference Laboratory at Orlando, Fla. His early work was in the field of rocket testing. Later he was in charge of programs to develop infrared and optical techniques for missile guidance.

In recognition of his laser work, on which he has concentrated in recent years, he was awarded an Army R&D Achievement Award in 1964. He also received this award in 1961 for his work with infrared techniques. The Army Missile Command Scientific and Engineering Award was presented to him in 1964 and again in 1966.

Col James E. Wirrick

Col Benedict L. Freund

Lt Col John E. Steinke

Lt Col Robert Sherman

OCRD Announces 19 Personnel Assignments

Normally heavy summer turnover in the Office of the Chief of Research and Development gave new assignments to 19 personnel on the headquarters staff since issuance of the September *Army R&D Newsmagazine*.

COL JAMES E. WIRRICK, one of the "charter members" of the U.S. Army Research Office, is the new commanding officer of the U.S Army Behavioral Science Research Laboratory (BESRL), Washington, D.C.

From 1957 to 1960, he served as assistant and then executive secretary of the Army Scientific Advisory Panel (ASAP) under the first two chiefs of R&D, Lt Gen James M. Gavin (1955–58) and Lt Gen Arthur G. Trudeau (1958–62).

Col Wirrick recently completed a 3-year tour as senior standardization officer with the Standardization Group in Canberra, Australia. He succeeds Col Marshall O. Becker, now assigned to the U.S. Army Instruction Group, Senior ROTC, Massachusetts Institute of Techonlogy.

A 1946 graduate of the U.S. Military Academy (USMA), he earned an MS degree in psychology from the University of Miami (1962), completed the Command and General Staff College (C&GSC) in 1956, and attended and taught at the Special Warfare School at Fort Bragg, N.C. (1962–65).

He has been awarded the Bronze Star Medal (BSM), the Army Commendation Medal (ACM) with Oak Leaf Cluster (OLC), the Korean Presidential Unit Citation and the Navy Commendation Medal.

COL GEORGE W. EVERETT was assigned as chief of the Southeast Asia Division after a tour in Vietnam with the 9th Infantry Division and the I Field Force.

From 1965–67 he served as assistant deputy G-1, HQ USARPAC. He was executive, special assistant to the Chief of Staff for special warfare from 1962–64.

Col Everett earned a BS degree from the University of Maryland and an MBA degree from George Washington University. Military schooling includes the Army War College (1965), Armed Forces Staff College (1959), and the C&GSC (1955).

He holds the Distinguished Service Cross (DSC), Silver Star, Legion of Merit, BSM with V device, Air Medal with V device and 11 OLC, Purple Heart with OLC, Vietnam Cross of Gallantry with Gold Star, Vietnam Armed Forces Honor Medal, Combat Infantryman Badge with one star, and the Parachutist Badge.

COL BENEDICT L. FREUND was assigned as deputy chief of the Physical and Engineering Sciences Division, following a year as chief of the U.S. Army Wound Data, Munitions Effectiveness Team (Vietnam).

Other assignments have included International Logistics Directorate, Office of the Deputy Chief of Staff for Logistics (164–67); 6th Missile Battalion, 61st Artillery in Germany (1963–64); and with the Logistics Division, HQ U.S. Army Europe (USAREUR), from 1961–63.

Col Freund has a BS degree in personnel management from Temple University (1949), graduated from the C&GSC in 1961, and has received the BSM with OLC and the ACM.

LT COL WILLIAM D. GRANT completed a tour of duty in Vietnam with the Support Command and the 1st Battalion, 69th Armor, 4th Infantry Division, prior to his assignment as a staff officer with the Combat Materiel Division.

From 1964–67 he served with the U.S./Federal Republic of Germany Main Battle Tank Program in Warren, Mich., with the 3d Battalion, 66th Armor, Fort Hood, Tex. (1963–64); U.S. Army Test Board, Fort Greeley, Alaska (1960–63); and the U.S. Army Armor Board, Fort Knox, Ky. (1955–59).

Graduated from the USMA in 1947, he received an MS degree in mechanical engineering from the University of Alabama in 1956, and completed the C&GSC in 1960.

He holds the LOM with OLC, the Air Medal and the ACM.

LT COL JOHN E. STEINKE served in Vietnam with the 1st Signal Brigade prior to his assignment with the Tactical Satellite Communications Office, OCRD.

Lt Col J. W. Park Jr.

Lt Col E. H. Birdseye

Lt Col H. C. Jelinek

Lt Col C. J. Landry

Lt Col L. J. Greeley

He has served with the Western NORAD Region/4th Air Force, Hamilton AFB, Calif. (1964–67); Defense Communications Agency, Elmendorf AFB, Alaska (1961–64); and the U.S. Army Combat Developments Experimentation Center, Fort Ord, Calif. (1959–61).

Lt Col Steinke received a BS degree in electrical engineering from the University of California (1948), and an MS degree in communications engineering from the University of Michigan (1957). He holds the Joint Services Commendation (JSCOM) Medal with OLC.

LT COL JOSEPH V. SPITLER JR. was assigned to the Southeast Asia Division, following an assignment with G3, U.S. Army Vietnam.

Graduated from the Virginia Military Institute with a BS degree in civil engineering in 1949, he received an MS degree in mechanical engineering from the University of Arizona in 1967 and graduated from the C&GSC in 1965.

In recent years he has served with the 1st Battalion, 5th Artillery, 1st Infantry Division, Vietnam; and the 2d Battalion, 5th Artillery, USAREUR. He holds the LOM, DFC, BSM, AM and the ACM.

LT COL ROBERT SHERMAN is serving as a military assistant with the Missile Development Division, U.S. Army Advanced Ballistic Missile Defense Agency. Until recently he was chief of the Joint R&D Section, MAAG, Germany.

Lt Col Sherman holds an AB degree in physics from Temple University (1945), an MS degree in engineering science from Purdue University (1955), and was an associate professor with the Department of Ordnance, USMA (1960–63). He completed the C&GSC in 1964.

Other assignments have included service with the I Corps, Vietnam (1959–60); Army Ballistic Missile Agency, Redstone Arsenal, Ala. (1956–58); Missile Development Division, Aeroballistics Laboratory Redstone Arsenal (1955–56).

LT COL JOHN W. PARK JR. served as battalion commander with the 11th Engineer Combat Battalion in Korea, until assigned to the Regional and Special Projects Branch, Environmental Sciences Division.

Within the past five years a tour of duty with the Taiwan Defense Command in Taipei preceded three years as deputy professor of military science at the University of Missouri.

He earned a BS degree in civil engineering from Louisiana State University (1950), an MS degree in civil engineering from Purdue University (1962), completed the C&GSC in 1965, and holds the JSCOM Medal and the ACM with two OLCs.

LT COL ROBERT L. JOHNSON completed a 3-year tour with the Standardization Group in Melbourne, Australia prior to his new assignment as a staff officer with the Air Defense and Missiles Division.

A 1951 graduate of the USMA, he has served with the U.S. Army Combat Developments Command (USACDC) and Air Defense Agency and School at Fort Bliss, Tex. (1961–64).

He was an instructor with the Department of Mathematics, USMA, from 1954–58, earned his MS degree in aerospace engineering from the University of Arizona in 1961, and completed the C&GSC in 1965.

Lt Col Johnson received the Purple Heart for action in Korea, and holds the Combat Infantryman Badge.

LT COL ELMER H. BIRDSEYE was assigned as chief of the Research Plans Office after graduating with a master's degree in engineering administration at George Washington University.

A 1951 graduate of the USMA, he completed the C&GSC in 1964 and served with the 1st Infantry Division and with HQ USARV (1966–67). He has served with the Office of Personnel Operations, DA (1964–66); 1st Missile Battalion, Korea (1962–63), and was assistant professor, Department of Earth, Space and Graphic Science at the USMA (1958–62).

Lt Col Birdseye holds the BSM, AM, ACM and the Meritorious Unit Commendation for Vietnam service.

LT COL HOWARD C. JELINEK returned recently from his second tour of duty in Vietnam for an assignment to the Nuclear, Chemical and Biological Division.

He served his first tour in Vietnam from November 1964 to December 1965, then was an honor graduate from the Naval War College Command and Staff Course. He served as an instructor of modern weapons employment at the Air Defense School, Fort Bliss, Tex. (1962–64), and earlier was with the 101st and 82d Airborne Divisions.

Lt Col Jelinek holds the Silver and Bronze Star Medals, AM with five OLCs, ACM with two OLCs, Vietnamese Gallantry Cross with Silver Star and OLC.

LT COL ALVIN M. QUINT, staff officer, Long Range Plans Branch, Plans Division, recently completed a tour of duty with HQ USARV and 9th Infantry Division in Vietnam.

He served with the USACDC Infantry Agency at Fort Benning, Ga. (1963–65) and received an MS degree in transportation and industrial management at the University of Tennessee (1967). He earned a bachelor's degree in general education from the University of Omaha in 1961, completed the C&GSC the same year, and from 1962–63 served with the 1st Cavalry Division in Korea. He holds the LOM, DFC, BSM with V Device, and the ACM with three OLCs.

LT COL ALLEN F. GRUM is

(*Continued on page 16*)

R&D Career Officer Assigned as ECOM Chief of Staff

Col John W. Ervin, an artillery officer whose career field is research and development, is the new chief of staff for the U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J.

Col Ervin was assigned to ECOM following a 2-year tour of duty at Fort Sill, Okla., as executive officer of the III Corps Artillery and (later) commander of the 214th Artillery Group.

In 1964, he was assigned as chief of the Chemical-Biological Office, Office of the Chief of Research and Development. He then completed the one-year course at the Industrial College of the Armed Forces, and earned an MBA degree from George Washington University in 1966.

Graduated from the Command and General Staff College after serving three years as assistant professor of military science at Ohio State University, he then earned a degree in aeronautical engineering from the University of Michigan. In 1942, he received his BS in chemistry from Rutgers University, along with his ROTC commission in the Army.

He taught at the Chemical Corps School, Edgewood Arsenal, Md., and at the Armored School, Fort Knox, Ky., following World War II, during which he saw action in seven campaigns in Africa and Europe.

Other assignments have included command of the 1st Battalion, 42d Artillery (Honest John), 4th Missile Command (1966); Missile Division of the Artillery Board, Fort Bliss, Tex. (1957); and 504th Field Artillery Battalion, Panama.

Col John W. Ervin

OCRD Announces 19 Personnel Assignments

(*Continued from page 15*)

assigned as a staff officer with the General Materiel Branch, Combat Materiel Division, OCRD. He recently completed a tour of duty as CO of the 589th Engineer Battalion and deputy chief of Military Operations, Engineer Division, HQ USARV.

Graduated from the USMA in 1953, he later served a 3-year tour there as an associate professor and earned an MS degree from the Massachusetts Institute of Technology (1958). He completed the C&GSC in 1954.

He served as assistant S–3 with the 56th Engineer Battalion in Germany (1962–64), and holds the LOM, BSM with V device, and the ACM.

LT COL CLIFFORD J. LANDRY was assigned as a staff officer with the Communications-Electronics Division after completing the C&GSC. He is a 1953 graduate of the USMA, and earned an MS degree in electrical engineering from the University of Arizona in 1962.

After completing a tour of duty in Vietnam with the III Corps and the 49th ARVN Regiment, he was assigned to the Support Command, 82d Airborne Division at Fort Bragg, N.C., in 1967.

Other major assignments include service with the Airborne, Electronics and Special Warfare Board, and the 505th Airborne Division at Fort Bragg.

He holds the BSM with V device and OLC, the Air Medal, two ACMs, the Combat Infantryman Badge (CIB) and Master Parachute Badge, and the Vietnamese Cross of Gallantry.

LT COL LEONARD J. GREELEY is assigned as staff officer, Human Factors Branch, Behavioral Sciences Division, after completing the C&GSC.

Major assignments include tours of duty with the Advanced Infantry Training Brigade at Fort Lewis, Wash. (1966–67); 8th Infantry Division, USAREUR (1966); and with the 82d Airborne Division and 2d Battalion, 325th Infantry at Fort Bragg, N.C. (1964–65).

Lt Col Greeley is a 1953 graduate of the USMA, and holds the CIB and Master Parachutist Badge.

LT COL HENRY L. DAVISSON JR. is a new staff officer with the Industrial Liaison Branch, Technical and Industrial Liaison Office, OCRD.

He served as CO, 2d Battalion (Mech.) 2d Infantry, 1st Infantry Division in Vietnam (1967–68) and was assigned to the 3d Battalion, 6th Infantry, Berlin Brigade in Germany, from 1963–65. He graduated from the C&GSC in 1967.

Lt Col Davisson holds the LOM, DFC with OLC, Soldier's Medal, BSM with OLC, AM with 9 OLCs, ACM with OLC, and the CIB.

LT COL ORBUN F. QUALLS JR., assigned as a staff officer with the Air Defense and Missile Division, until recently served in Vietnam as G1 with the Americal Division.

He worked on research at Livermore Radiation Laboratory (1963–66) and completed the C&GSC in 1967. Other tours include command and staff assignments with Infantry and Armor divisions in Europe (1955–58); staff officer with Infantry troops in the U.S. (1958–59); and as G–3 (Nuclear Weapons), 7th Infantry Division, Korea (1962–63).

He received a BS degree from the USMA in 1954, an MS degree in mechanical engineering from the University of Southern California in 1962, and from 1963 to 1966 was an officer research associate at the Lawrence Radiation Laboratory (LRL) in Livermore, Calif. The LRL is operated for the U.S. Atomic Energy Commission by the University of California, under a program initiated in 1959. (See *Army R&D Newsmagazine*, March 1967, p. 30, for details on the program.)

He holds the LOM, the JSCOM and ACM with OLC.

MAJ EDWARD J. KELLY III completed a tour of duty with the 199th Light Infantry Brigade in Vietnam prior to his new assignment with the Programs and Budget Division.

He was professor of military science at the Benedictine Military School at Savannah, Ga., for three years before he completed the C&GSC in 1967. He earned a BS degree in history and government from Georgetown University in 1954.

He served with HQ KMAG, Korea (1961–62); 2d Armored Division, Fort Hood, Tex. (1958–60); MAAG, Turkey (1957); and with the 8th and 9th Divisions in Germany (1955–57).

Maj Kelly has received the BSM with V device, Air Medal with three OLCs, ACM, and the CIB.

MAJ ROBERT E. JOSEPH JR. is assigned as a staff officer, Policy Branch, Management and Evaluation Division, after serving with the 9th Infantry Division, USARV.

A 1955 graduate of the USMA, he completed the C&GSC course in 1967, a Defense Language Institute course in the Thai language at Monterey, Calif in 1965 and served as a U.S. adviser to the Royal Thai Army in 1965–66. He has earned the Silver Star, BSM with V device, Air Medal with OLC, and the ACM with OLC.

MAJ PETER D. BOORAS served in Vietnam with the S–3 Battalion and S–5 Brigade until assigned to the Nuclear Branch, Nuclear, Chemical and Biological Division, OCRD.

He earned an MS degree in nuclear engineering from the Georgia Institute of Technology in 1964, and was an instructor and assistant professor at the USMA from 1964–67.

He holds the Silver Star, BSM with two OLC, Air Medal with 11 OLCs, ACM, Vietnamese Honor Medal, Vietnamese Cross of Gallantry with Gold Star, and the CIB.

Rambo Joins ECOM Electronics Advisory Group

Stanford University's associate dean of the School of Engineering, Prof. William R. Rambo, is the newest member of the Electronics Advisory Group, Army Electronics Command (ECOM), Fort Monmouth, N.J.

Composed of nine leaders from universities, industry and professional societies, EAG advises the ECOM commanding general and his scientific staff on development of electronic equipment for the Army.

Prof. Rambo is also director of the Electronics Laboratory at Stanford, where he received bachelor of arts and electrical engineering degrees.

Prof. William R. Rambo

From 1939 to 1942, he was in the radio broadcasting industry in California and Oregon. He then joined the Radio Research Laboratory staff at Harvard University to work on electronic countermeasures, microwave oscillators and frequency modulation.

After World War II he was employed by Airborne Instruments Laboratory in Mineola, N.Y. In 1951, he returned to Stanford to assist in organization and operation of the applied research program in electronics. He was appointed to the engineering faculty in 1957.

Prof. Rambo is vice chairman of the Engineering College Council of the American Society for Engineering Education, a member of numerous professional organizations, holds several patents and has contributed to many technical publications and books.

JSO Establishes Tactical Command, Control, Communications Group

Approval of its functional charter still is pending, but the new Joint Service Office for Tactical Command, Control and Communications is well established as an operational unit.

Located in the Pentagon, Washington, D.C., the Army-Air Force-Navy-Marine Corps organization currently consists of a chairman, one representative of each service and an administrative staff.

Col Robert H. Offley, former Army member, recently became chairman of the group, succeeding Col Marvin E. Kay of the Air Force. Col James M. Templeman is the new Army member, Capt Frank T. Hemler represents the Navy, Col James Inglis the Air Force and Col Urban A. Lees the Marine Corps.

Commonly called the Joint Service Office (JSO), the unit was established on Mar. 26, 1966. Cyrus Vance, then Deputy Secretary of Defense, directed that action be taken to ensure that Tactical Command, Control and Communications (TC^3) of the services would be compatible, that equipment be procured for common use wherever practical, and that new TC^3 developments be undertaken as necessary to improve joint operations.

Members of the group are selected for their expertise and the policy is to encourage candid expression of opinion regarding problem areas and possible solutions in TC^3 systems, including programs to be considered. The idea is to work out some of the potential problems before they are actually encountered.

When a problem area is identified through cross-service exchange of knowledge, JSO members may visit the industries concerned, study the equipment involved, and prepare recommendations to the appropriate agency. Most of the recommendations have been well received.

When objections are encountered, the policy is for each member to go back to his service at the lowest responsible level to expedite practical solutions to compatibility problems. This reduces paperwork and gives credit to the personnel responsible for making the system work.

Within the guidelines of Department of Defense Directive 4630.5, Joint Chiefs of Staff publications 10 and 11, and the Worldwide Tactical Command and Control Study, the JSO emphasizes technical compatibility of the TS^3 systems rather than cost effectiveness. The JSO suggests changes in guidelines as necessary.

What may be considered most desirable from a compatibility objective, however, is not always feasible from a means or resources viewpoint. Timing the introduction of new equipment into the operational inventory may at times be complicated by delays or termination of programs within one or more of the services.

When scheduling is thrown out of phase by unpredictable factors, the task of the JSO is to reach agreement on what changes or adjustments must be made within a reasonable time frame to maintain an acceptable level of TS^3 system compatibility. The goal is to make whatever changes are essential to avoid serious degrading of compatibility of automated systems.

JSO members are charged with the responsibility of keeping currently informed on tactical command, control and communications systems within the participating services. This involves visits of the group to facilities within and outside the United States on an average of once every six weeks or more often when the urgency of the situation demands.

In the Army, visits may be made to the Combat Developments Command, the Electronic Proving Ground at Fort Huachuca, Ariz., and the Strategic Communications Command; in the Navy, to cruisers, aircraft carriers, shore-based command centers and the Naval Electronics Laboratory; in the Air Force, to the Tactical Air Command, the Air Proving Ground at Eglin Air Force Base, Fla., and the Electronic Systems Division; in the Marine Corps to the Landing Forces Development Center and Marine Air Control Squadrons.

Proliferation of computer "languages" complicates the problem of maintaining TS^3 system compatibility, and the JSO does not foresee a single standard computer language in the near or distant future. Rather, stress will be on agreement on the specific content of messages transmitted and the proper interpretation of bits or even the lack of bits of information transmitted between systems.

JCS Publication 10 details some message formats and transmission speeds as an effective means of achieving compatibility, but many other compatibility problems continually arise in a joint operational environment. This means that each system must accomodate all its own designation schemes and those of the other services' systems as well.

Compatibility thus entails extensive and complicated cross correlation, a large storage capacity or some effective standardization—all of which are complicated by the lead time for new programs within the services concerned, ranging to two years.

Much of the current JSO effort is being directed to compatibility among the Army's Weapons Control and Coordination System, the Air Force Tactical Air Control System, and the Navy and Marine Corps Tactical Data Systems.

Col Robert H. Offley

JSO members operate with logical latitude in certain situations but normally adhere to a prescribed procedural pattern. After consulting with key officials in their respective services on a problem, members hold technical discussions with single service, multiservice or industrial representation, as dictated by the situation, in striving for unanimity of opinion on a solution. In some cases, minority reports are made.

Staff elements of the Office of the Secretary of Defense and the Military Departments submit written memoranda of problem areas of tactical importance to the JSO. When agreement is reached on a possible solution, a recommendation is forwarded to the requesting agency. Similar information is furnished to other concerned agencies.

Decisions regarding the recommendations rest with the appropriate command authorities. When substantive policy or program determinations are required, the recommendations are submitted to the Assistant Secretaries for R&D of the Military Departments for comment on actions.

Dep CO Assigned to USAEPG

Col Edward Strongin, new deputy commander of the U.S. Army Electronic Proving Ground (USAEPG), assumed his duties following retirement of Col James A. Wiley.

Prior to his USAEPG assignment, Col Strongin served with the U.S. Joint Military Assistance and Advisory Group (PROVMAAG-K) as senior liaison officer to the Minister of National Defense and the Joint Staff, Republic of Korea.

Col Strongin served at Fort Bliss, Tex., and at Fort Huachuca as post director of logistics (1951–1952).

'World's Highest Research Station' Serving Army Interests

U.S. Army knowledge of physiological factors associated with operations in a high-mountain environment has been increased considerably by observations atop the "World's Highest Research Station" at the 17,600-level of Mt. Logan.

Established in 1967 by the Arctic Institute of North America (AINA), funded by the U.S. Army through the Army Research Office in Durham, N.C., with support from the Canadian Armed Forces, the Mt. Logan facility is in the southwest corner of the Yukon Territory in Canada, just across from the Alaskan border.

Related environmental studies are supported by the U.S. Army under contract with AINA in the Chitistone Mountains at the 6,000-foot altitude a short distance from Mt. Logan in Alaska.

Intended to gather information on physiological reactions and other factors generally associated with activities in similar high altitudes in other parts of the world, such as the Himalayan Mountains in India, the Mt. Logan project is reported to have established definitely the feasibility of research operations at this level. The Chitistone conditions are believed comparable to passes in the Himalayans at the 16,000-foot elevation.

AINA investigators report that this high-mountain laboratory, accessible for all practical purposes only by air much of the year, offers a "unique environment" meriting an overall future experimental plan. The environment is that of extreme cold, heavy snowfalls, high winds, isolation and overall impact of oxygen lack.

The report states: ". . . We are now satisfied, nevertheless, that the risks of work in this environment are not significantly greater than the risks of work in studies elsewhere, nor greater than those which men face when they leave the protection of society to enter the desert, the mountains, the polar regions or to sail the seas."

TURBO-HELICOPTER used for evacuation of medical patients at Mt. Logan.

The report points out, however, that "We do not think it wise or safe to operate the facility without sufficient acclimatized people to shift the plane and to handle the physically demanding work which new arrivals do less easily."

An imperative requirement, the report states, is that a physician with extensive high-altitude experience be always available at the base camp, located at the 2,500-foot level at Kluane Lake, about 90 miles from Mt. Logan at Mile 1054 on the Alaskan Highway. A doctor without this experience is not considered practicable at the Mt. Logan research station.

Buried under four feet of snow and entered by a winding staircase of snow, the Mt. Logan laboratory measures 32 by 12 by 9 feet and is described as "quiet, dim and secure," with light and heat provided by propane gas.

Two supplementary camps have been established. Divide Camp is at the 8,600-foot-elevation about half way between Mt. Logan and the base camp at Kluane Lake. Another camp is at the 11,000-foot elevation where the climbers to the peak of Mt. Logan started their ascent in the King Trench.

Relative to the research conducted, the report states: "The most important aspect of the total effort is the value which each component has for the others. In no other study . . . are so many different disciplines available to contribute to each other."

A 4-man team from the U.S. Army Cold Regions Research and Engineering Laboratories (CRREL), Hanover, N.H., under the direction of Charles Keeler, conducted extensive snow and ice studies in the laboratory vicinity.

Two automatically recording weather stations to gather temperature and pressure data for a period of one year were installed by the CRREL team at 18,000 feet on Mt. Logan and at 9,000 feet at Divide Station. Data, when combined with upper air soundings at Yakutat, Alaska, and Whitehorse, Yukon Territory, will permit profile calculations of winter storms across the St. Elias Mountains.

The Canadian Department of Transport (correct) receives weather data from the project and is reported to have expressed great interest in this phase of the project for relevance to aviation weather.

Three-meter pits were dug at approximately 1,000-foot intervals between 10,900 and 17,700 feet to make observations on weather and density. A 15-meter core was extracted at 17,600 feet for comparison with those parts of Greenland and the Antarctic with similar tempera-

TUBULAR-STEEL-FRAME tent will be used next year at Mt. Logan. Capable of withstanding 100-mph winds, the tent is made of two layers of polyethelene fabric impervious to weather. The inside frost liner "breathes air" to the space between liners. It was developed by the Arctic Institute of North America in conjunction with Baynard Miller of Versadome Corp., Philadelphia, Pa.

ture regimes. Temperature data from the core hole indicate that the mean annual temperature at this elevation is on the order of 27 degrees C. below zero.

Army Calls for Production Of Transportable Earth-Borer

Production of a feasibility model of a military design earth-boring machine is required by a $94,785 contract awarded by the U.S. Army Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, Va.

Designed for air transportability, the earth-boring machine is being developed to permit rapid access to buried unexploded munitions such as bombs and missiles. Delivery is scheduled for early 1969 by Texoma, Inc., Sherman, Tex.

The contract calls for a machine to drill an 8½-foot-diameter hole to a depth of 40 feet. The machine will be equipped with Kelly extensions so that holes up to 70 feet deep can be drilled. A GM Model 4–53 diesel engine will transmit power to the Kelly rotary table by a hydrostatic drive through a 4-speed transmission, thence to the final drive gear box.

Mounted on an International truck powered by a GM 6V–53 diesel engine, the machine will be equipped with hinge-mounted demountable hydraulic outriggers that can be used to remove the earth-boring machinery from the chassis as well as stabilize it for hole drilling. The machinery frame also will serve as skids for movement into and out of an airplane.

The drilling machinery and transporter will weigh approximately 48,000 pounds, permitting it to be air transported in two C–141 type aircraft. It will have a highway speed of 35 miles an hour, 20 miles an hour on secondary roads, and be able to traverse rough terrain.

As part of the same project, the MERDC awarded a $27,500 contract to Commercial Shearing and Stamping Co., Youngstown, Ohio, for fabrication of one 8-foot (inside-diameter) nonmagnetic aluminum hole liner set for an excavation 70 feet deep. It will include a 10-foot-high shaft safety extension.

ECOM Team Gets Crystal Patent

A patent for developing a method of growing electronic crystals expected to have industrial as well as military applications was granted recently to three Army Electronics Command scientists.

Arthur Tauber, Robert Savage and Thomas AuCoin, all employed in ECOM's Institute for Exploratory Research, succeeded in growing single crystals of barium zinc ferrite for microwave filters.

The ECOM team is believed the first to synthesize this material in single-crystal form, and has grown the largest and most perfect single barium-zinc-ferrite crystal reported to date.

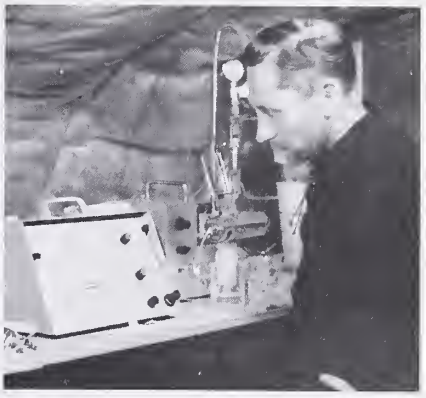
In the meteorological research program, standard observations of cloud cover, wind, temperature, air pressure and precipitation, and upper atmosphere by a Helio-Courier STOL aircraft were made to describe the environment. Radiation measurements were made at the 17,600-foot elevation.

Weather data collected in the studies were relayed through the Burwash and Mt. Logan weather stations in coordination with the chief climatologist of the Yukon Territory, Herb Wahl, Department of Transport.

Studies extending over numerous scientific disciplines were made by scientists working on doctoral degree projects in the Chitistone area. Among these were researchers from the University of Michigan, Carleton University, Brown University and the University of Illinois.

Studies conducted by these scientists included snow/phenology observations, movement of the ice and morainic debris, land classification and photo interpretation, plant growth life, mammal species, and thermocouple observations through moraine and ice as well as permafrost soundings.

The bowl-shaped plateau at the 17,600-foot elevation of Mt. Logan provided a suitable protected landing and takeoff facility for Helio Super Courier (turbo-charged) flights. A turbo-helicopter was landed at the 17,600-foot level and used as a back-up aircraft in support of the Helio Courier.



POTENTIOMETER used for blood count studies at 17,600-foot Mt. Logan.

Mt. Logan Project Manager Philip P. Upton, a World War II pilot who has had considerable high mountain-glacier flying experience since he joined the Arctic Institute of North America staff in 1961, made a total of 54 flights over a 2-year period.

Dr. Walter A. Wood of Arlington, Va., has served as project director of the AINA Ice Field Ranges Research Project since work began in 1961 and is chairman of the advisory committee for the Mt. Logan project.

MIT Lincoln Lab Deputy Director Takes ODDR&E Post

Newly appointed assistant director (Defense Systems), Office of the Director of Defense Research and Engineering (ODDR&E), is C. Robert Wieser, until recently deputy director, Massachusetts Institute of Technology Lincoln Laboratory.

Associated with the MIT since 1951, Wieser has served successively as leader of the SAGE (Semi-Automatic Ground Environment) Design Group; associate head of the Aircraft Control and Warning Division (ACWD) and a member of the Lincoln Laboratory Steering Committee; head of the ACWD; assistant director of the laboratory from May 1966 to January 1967; acting director of the laboratory and since October 1967 also the deputy of the MIT Instrumentation Laboratory.

He has served as a special consultant to the commander of the Air Force Systems Command, as a member of the Range Technical Advisory Group, and as a member of the Ballistic Missile Defense Advisory Committee, Advanced Research Projects Agency.

Since 1963, he has been a member of the Reentry Programs Review Group of ODDR&E. He was a special adviser to the ad hoc Committee on Instrumentation Ship Support of Reentry Systems, appointed by the Scientific Advisory Board to the Chief of Staff, U.S. Air Force. In 1967, he was appointed a member of the Division Advisory Group to the Aeronautical Systems Division, Air Force Systems Command.

Graduated from MIT with BS and MS degrees in electrical engineering, he is a member of the Institute of Electrical and Electronics Engineers, the American Association for the Advancement of Science, and Sigma Xi.

C. Robert Wieser

Major RDT&E, Procurement Contracts Total $619 Million

Army contracts for research, development, test and evaluation, and procurement, each in excess of $1 million, totaled $619,471,849 from Aug. 9 through Sept. 8.

Olin Mathieson Chemical Corp, received $119,650,974 on a new contract and other modifications for production of propellants, ammunition components and 60mm illuminating projectiles.

National Presto Industries, Inc., was issued a $46,800,000 contract for metal parts for 105mm projectiles and Sperry Rand Corp. will receive $43,977,106 for manufacture of major caliber ammunition items.

Two contracts totaling $31,847,947 went to AVCO Corp. for gas-turbine engines, and turbine rotor blades to support the T–53 engine applicable to UH aircraft. Hercules, Inc., was awarded a $31,585,496 modification contract for propellants, explosives and support services.

National Gypsum Co. received a $30,827,000 modification for 105mm ammunition items, R. G. Le Tourneau, Inc., $28,903,320 in two contracts for parts and fin assemblies for 750-pound bombs, and Raytheon Co. $21,613,212 for engineering services and test equipment for the Hawk missile systems.

A fourth increment of $20,738,456 to a 5-year buy contract for M551 assault vehicles went to General Motors Corp. Honeywell, Inc., received $16,624,349 in four contracts for parts for 40mm cartridge fuzes and for facilities and special assembly machines for fuzes for artillery projectiles.

Levinson Steel Co. gained a $14,-509,066 contract for parts for 105mm projectiles and Atlas Chemical Industries, Inc., a $12,949,541 contract for TNT.

A $12, 132, 370 contract to Day and Zimmermann, Inc., is for loading, assembling and packing ammunition items. Donovan Construction Co. will receive $11,264,750 for parts for 155mm projectiles and Whirlpool Crop. will get $10,293,606 in four contracts for parts for 152mm cannisters and for 90mm and 105mm projectiles.

Northrop-Carolina, Inc., won $10,-137,405 in contracts for 40mm cartridge cases, 152mm canisters, 90mm projectiles and for 105mm projectile metal parts.

Contracts under $10 million. Uniroyal, Inc., was awarded a $9,842,637 on a modification for explosives, loading, assembling and packing ammunition, and for support services. Two contracts with United Aircraft Corp. totaling $9,500,000 are for CH-54A helicopters with engine-air particle separators, crew armor, and for product improvement to increase capability of helicopters.

Two contracts for $8,575,000 with Hamilton Watch Corp. are for mechanical time fuzes and for rear fitting and safety devices for an artillery proximity fuze. Teledyne Systems Co. will be paid $8,000,000 for central computer complex components for use in Cheyenne AH-56A aircraft.

Philco-Ford Corp. was awarded $7,994,625 in two contracts for guidance and control equipment for Shillelagh guided missiles, Chaparral fire units and weapons system test equipment. ITT is receiving $7,878,000 for image intensifier assemblies.

A total of $7,525,821 in contracts to Bell Helicopter Co. are for UH-1H helicopters, rotary rudder booms, and environmental control systems for AH-1G helicopters. General Time Corp. received a $6,891,091 contract for mechanical time fuzes.

Eureka Williams Co. will receive $6,833,664 for parts for aerial bomb fuzes. Amron Orlando Corp. added two contracts totaling $6,307,438 for 40mm cartridge fuzes and for special assembly machines for manufacturing M551 fuze parts.

Two contracts totaling $5,658,653 to Zenith Radio Corp. are for rocket fuzes. URS Corp., San Mateo, Calif., was awarded a $5,513,005 contract modification for design, programing and testing of prototype software for the Combat Service Support System.

Litton Systems, Inc. received a $5,120,352 contract for a data converter, coordinated AN/GSA–77 air-defense system.

Contracts under $5 million. Magnavox Co., $4,666,200 for M18 gun direction computers; Chamberlain Manufacturing Co., $4,334,587 (two contracts) for parts and base plugs for illuminating projectiles, and for a modification for parts for 155mm shells; and

Hercules Engines, Inc., $3,934,803, gasoline-operated military standard engines; Crescent Precision Products, $3,619,980, fin assemblies for 750-pound bombs; Union Carbide Corp. (two contracts), $3,193,032, radio-set dry batteries; and

Fairchild Space and Defense Sys-

Marine Unit Tests TOW in Desert Environment

Devastating power and accuracy displayed by the U.S. Army's new antitank weapon, the TOW missile, in a demonstration against bunkers has prompted interest of U.S. Marines in acquiring the system.

Consideration of use of the Army weapon was stimulated by results of 20 TOW missile firings by a Marine unit at the Twentynine Palms Marine Base in California. They blasted concrete fortifications, sandbag bunkers, tank hulls and moving targets.

Developed under management of the U.S. Army Missile Command, TOW is a wire-guided unit that is controlled by the gunner's line of sight. In one test a truck driver with little training guided the missile accurately to the 4-inch gun slit in a-distant barely visible sandbag bunker.

Simulated combat conditions prevailed during the tests and TNT charges were detonated in the gunner's line of sight to duplicate an enemy artillery barrage. Ruggedness tests included bouncing the weapons over desert terrain on jeeps and mechanical mules, and firing them successfully after they had been airlifted by helicopter.

TOW missiles have been fired from helicopters at both fixed and moving targets, and have been selected as armament for the Army's new armed helicopter, the AH-56A Cheyenne. They have been undergoing extensive field tests at Fort Benning, Ga., White Sands (N. Mex.) Missile Range, and Fort Greeley, Alaska.

TOW MISSILE streaks toward target during recent tests by U.S. Marines.

tems, $3,092,800, fuzes for 2.75-inch rockets; Farmer's Chemical Corp., Tyner, Tenn., $2,861,700, mixed acids and support activities; Bell and Howell Co., $2,707,740, metal parts for 81mm projectile fuzes; and

Pace Corp., $2,612,540, surface trip flares; Holston Defense Corp., $2,407,155, production of explosives and support services; Bulova Watch Co., $2,484,600, head assemblies for 60mm projectile fuzes; and

Colt's Inc., $2,395,503, line items of repair parts in support of the M16; Cerro Copper and Brass Co., $2,138,250, metal parts for fuzes; Pacific Technican Analysts, Honolulu, Hawaii, $2,091,712, classified contract work to be done in Vietnam; and Stewart-Warner Corp., $2,020,884, metal parts for 60mm projectiles.

Contracts under $2 million. Hughes Tool Co., $1,947,096 for crew armor and component kits for OH–6A helicopters; La Pointe Industries, Inc., $1,897,570 for fixed-base mounted antennae; Kilgore Corp., Toone, Tenn., $1,835,150 for pyrotechnics; and

American Fabricated Products Co., Inc., $1,712,689 for 81mm mortar fin assemblies; Pine Bluff Arsenal, $1,530,000, 105mm smoke projectiles; of research and scientific studies; and

Continental Motors Corp., $1,289,-Grand Machining Co., Detroit Mich., $1,480,777, fin assemblies for 81mm mortars; American University, $1,335,000 modification for continuation

APG Applies Rug Beating Principle to Fuze Tests

Knowledge gained in the old-fashioned chore of rug beating is being applied to a problem of stopping and quickly recovering mortar projectiles in fuze tests by Aberdeen (Md.) Proving Ground's Materiel Test Directorate.

If you are in the 50-to-60-year age bracket, you may have experienced how the rug "gave" with each swat of the beater. APG researchers are applying this same principle—the give reaction of a cloth blanket 18 layers thick—to stop and speed up recovery of projectiles 70 percent.

TEST DIRECTOR on a mortar fuzes project, Kenneth M. Davis, inspects a detonator for alignment after it was fired at the cloth blanket at Aberdeen Proving Ground. The blanket has stopped some 1,200 rounds in test firings with a minimum of wear and tear.

Tests are designed to insure that mortar fuzes destined for Army use will detonate on impact. To do this, each fuze lot is fired with inert components. Kenneth H. Davis, a test director, said the blanket method causes little or no damage to the projectiles, making them reusable.

In operation a little over a month, the new method is called a major improvement over the old, which originally called for firing test rounds into a bank of sand.

"When we first began testing fuzes two months ago," Davis said, "we used a standard muslin cloth target with a quarter-inch-thick plywood board set up 25 feet in front of it to slow down the round. Although this method is effective, we lost time searching the field for recovery. With the blanket we have immediate recovery."

The cloth target has taken some 1,200 hits so far and still shows little sign of wear and tear. The inert, low-energy rounds are fired at the blanket on a flat trajectory from 150 feet.

Asked how he got the idea for the blanket, Davis explained, "When I was assigned to the test mission, I remember a magazine article I had read years ago about stopping bullets with a blanket and thought I'd apply the technique to mortar testing."

Continental Motors Corp., $1,289,-Grand Machining Co., Detroit Mich., $1,480,777, fin assemblies for 81mm mortars; American University, $1,335,000 modification for continuation

431 for remanufacture and retrofit of engines for the M42 vehicle; Aerojet General Corp., $1,250,000 for bomb dispensers; and John Wood Co., St. Paul, Minn., $1,137,766 for fin assemblies for 750-pound bombs.

Laser Rangefinder Prototypes Pass Predelivery Tests

Prototypes of a laser rangefinder developed for the new Main Battle Tank (MBT–70) are many times more accurate than conventional rangefinders, predelivery tests have indicated.

Eleven of the prototypes, developed under an Army contract by the General Motors Corp., have been delivered for field testing. Preliminary tests showed that out of 1,000 range samples taken by the laser device, more than 95 percent were within specified minimum error limits.

The system calculates range by transmitting intense laser light beams and then measuring the time between transmissions and receipt of the returned beams reflected off the target. Officials said the rapid, automatic operation is a key factor in the exceptional first-round hit probability to be achieved by the MBT–70 fire control system.

Allison Division of General Motors, prime contractor for the U.S. in the MBT–70 joint developmental program with the Federal Republic of Germany, is fabricating prototypes of the tank at the Cleveland Army Tank-Automotive Plant. The German Development Corp. is contractor for the Federal Republic of Germany.

MERDC Camouflage Work Viewed For Possible Civilian Application

Florists and others interested in preserving cut foliage may benefit eventually from a phase of camouflage work at the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

Scientists are developing a preservative to prolong the life of foliage, primarily for use in the Army's camouflage program. Like many other Army R&D products, it may also have civilian applications.

Tests have revealed that a composite mixture of organics and metallic salts, dissolved in long-chain alcohols, will feed stems and thereby prolong the useful life of six species of cut foliage. Cuttings from hemlock, birch, oak, maple, holly and beech trees did not wilt or lose color and optical properties for up to six weeks.

Efforts are being made to develop a small plastic tube which will contain the material and be self-sealing when attached to the cut portion of the stem. The tube, when developed, will be in various lengths and diameters for field use by troops.

$13.8 Million Contract Orders Shillelagh System Components

Production of guidance and control equipment for the Shillelagh missile system is the basis of a $13,839,799 US. Army contract awarded recently to Aeronutronic Division of Philco-Ford Corp. for work at the Lawndale Army Missile Plant, Lawndale, Calif.

Shillelagh is a gun-launched guided missile system for combat vehicles now being deployed with Army troops. The 152mm gun-launcher can fire either missiles or conventional ammunition and is effective against moving or stationary targets.

The Shillelagh program is directed by the Army Missile Command, Redstone Arsenal, Ala., under Col. Robert J. Proudfoot as project manager.

AUTODIN Switching Centers Serving in Vietnam

Automatic Digital Network (AUTODIN) performance in the Vietnam conflict is beginning to associate lost and garbled teletypewriter messages with a bygone technological era because of R&D progress in accuracy, speed and security.

Engineering criteria call for AUTODIN to transmit a Flash message from one tributary to another anywhere in the world within 10 minutes. By the same standards, an Immediate message will normally make the trip in a maximum of 30 minutes, a Priority message in three hours and a Routine message in six hours.

Three of the 19 Automatic Switching Centers (ASC) programed for the worldwide network are located in Southeast Asia. ASCs in Korat, Thailand, and Phu Lam and Nha Trang, Vietnam have opened this year. The 1st Signal Brigade is responsible for two ASCs in Vietnam.

The change from torn-tape relays to automatic switching centers for transmission of data and printed messages is comparable to the change from manually operated telephone switchboards to automatic dial exchanges.

Tracing a message through the system from start to finish will illustrate how AUTODIN operates.

Somewhere among the half-million American servicemen in Vietnam someone sets pen to paper and another message begins.

After the message has been composed, it is typed on a form and delivered to the communications center.

When a message reaches the communications center or tributary, it is date-time stamped and logged in so that it is prepared for transmission in order or precedence. Then the message is typed on perforated tape.

The tape is fed through terminal equipment at a speed of 60 to 3,000 words per minute, depending on the type of equipment used.

This sophisticated machinery scrambles the electrical impulses created by the perforated tape, allowing transmission of classified messages. The message is transmitted electrically by cable and radio circuits.

A split-second later the message arrives at an ASC, where it is electronically scanned for precedence and routing. The complex electronic gear at the ASC has the ability to store messages and release them by precedence and, within each precedence, in the order they were received.

For example, if the switching center receives a message of each precedence (Flash, Immediate, Priority and Routine) at the same time, the messages are forwarded in order of precedence. If another Immediate message is received before these have been forwarded, it is forwarded after the first Immediate message, but before any Priority message stored in the memory bank of the ASC.

The switching center can simultaneously send and receive messages from all tributaries. The ASCs at Phu Lam and Nha Trang each have a capacity of 100 lines, while some centers are equipped to handle 200 tributary stations.

If a circuit is out of order between switching centers, the message is automatically forwarded by an alternate route. It goes directly from the switching center to its destination or is routed through one or more additional ASCs, depending upon the location of the addressee.

The process is repeated constantly as U.S. troops in Vietnam send and receive more than 60,000 messages a day through the two ASCs.

President Johnson Extends Tenure Of Heaton as Army Surgeon General

Army Surgeon General (Lt Gen) Leonard D. Heaton's tenure in that office, dating back to June 1959, was extended recently by President Johnson for the fourth time to May 31, 1969. His tenure had been scheduled to terminate Nov. 30, 1968.

President Dwight D. Eisenhower appointed General Heaton and President John F. Kennedy continued him in office. President Johnson extended his tenure in May 1965 and again in November 1966 for another two years.

General Heaton began his Army career as a medical intern in 1926. He has received numerous high honors in recognition of his exceptional achievements as a physician and surgeon, including the Distinguished Service Medal with two Oak Leaf Clusters, Doctor of Science degrees from Denison University and the University of Louisville, and a Doctor of Humane Letters from Brandeis University.

$9 Million Awarded for Kwajalein II Technical Support

Continued technical support of the Kwajalein Missile Range in the mid-Pacific, is the basis of a $9,770,000 contract awarded in mid-September.

The Sentinel System Command, headquartered at Huntsville, Ala., announced that the cost-plus-fixed-fee contract with Kentron Hawaii Ltd., covers work to be performed from Oct. 1, 1968, through Sept. 30, 1969.

The Honolulu-based firm has held the Kwajalein technical support contract for several years. The new contract calls for a variety of technical services, management, engineering and technical personnel necessary for operation of the complex range facilities, including telemetry systems, optical instrumentation systems, a photographic laboratory, electronic instrumentation systems, control center, a recovery system for ICBM-boosted target vehicles which impact in the Kwajalein lagoon and a data processing center.

Kwajalein Missile Range is the primary test area for the Sentinel System ballistic missile defense and is also used by the Air Force, Navy and Department of Defense for reentry physics studies. Many of these latter programs involve reentry observation of specially designed missile payloads launched aboard intercontinental ballistic missiles at Vandenberg Air Force Base, Calif., 5,000 miles away.

Kwajalein Missile Range is managed by the Sentinel System Command's Kwajalein Range Directorate.

Kissinger Assigned as Deputy for Operations at ECOM

Col (Brig Gen-designate) Harold A. Kissinger, the Army Electronics Command's new Deputy for Operations, recently arrived at Fort Monmouth, N.J., from Mannheim, Germany, where he commanded the 22d Signal Group, Strategic Communications Command-Europe.

This is Col Kissinger's first duty assignment at Fort Monmouth although he was commissioned there in 1944 and has taken both basic and advanced training in the Signal School, most recently as a student in the Associate Signal Advanced Course late in 1955.

Col Harold A. Kissinger

Col Kissinger served as a staff officer in the Office of the Deputy Chief of Staff for Logistics, Department of the Army (1960–62), and during this tour completed the Associate Command and General Staff College course at Fort Leavenworth, Kans. In May 1962 he moved to the Office of the Army Chief of Staff as a staff officer.

Following graduation in 1964 from the Industrial College of the Armed Forces at Fort McNair, Washington, D.C., he assumed command of the 304th Signal Battalion of the Eighth Army in Korea. From August 1965 until December 1967 he served in the Office of the Secretary of Defense as a politico-military aid in International Security Affairs.

CDC Envisions 'Home Cooking' for Troops

Preparation of food for troops in the field may be dramatically changed for the better if methodology envissioned in a U.S. Army Combat Developments Command study is adopted.

The Combat Developments Command long-range planners, who have a mission of determining how the Army of the future should be organized, equipped and fight, envision a system of food service in the field that will make it possible for the combat soldier to eat most of the time "every bit as well as he does in the dining hall." A revolutionary new type of field kitchen that will cook in a fantastically short time may provide the hardware to meet this goal.

Powered by a generator, the kitchen will have ultramodern equipment heated by microwave or conventional methods, including ovens, top burners, and an incinerator that will consume disposable trays, utensils and garbage.

Along with rapid food preparation, it is envisioned that ration breakdown simplified, and fewer people required in the process.

In fact, the major objective planned for the CDC Supply Agency is to reduce food preparation personnel requirements by two-thirds, thus cutting down the manpower involved in the logistics chain supporting the division. Currently about six percent of the division's strength is involved in food preparation.

High-quality foods preserved at sub-zero temperatures (not the frozen TV dinner types) are a part of the future planning, as are prepacked mixes of dough and high-speed bread ovens. Bread requirements for a company-size unit for one day now require about a full-day work cycle; the goal is a one-hour cycle.

The concept is that a battalion mess of a headquarters company might consist of three fast food kitchens with a total staff of 13 personnel, as compared with 29 food service men required by present methods.

Similar reductions are anticipated in requirements for other food-handling personnel, such as those involved in procurement, ration breakdown and distribution. The average Infantry division now has about 1,000 people involved in food service, including KPs.

In addition to the substantial benefits expected to accrue to the Army in monetary savings of providing satisfactory food for the combat soldier, the presumed changes in the need for support personnel would enable the field commander to put more men in combat operations.

The size of the efficiency kitchen unit contemplated would lend itself to movement by ground vehicle or airlift. Kitchens would move with the troops, providing "real home cooking." The traditional mess kit, as a result, might one day go the way of the wrap-around legging.

Traylor Assigned to AVCOM As Deputy CG, Chief of Staff

Brig Gen John O. Traylor, new deputy CG and chief of staff of the U.S. Army Aviation Materiel Command, headquartered at St. Louis, Mo., was director of maintenance, Army Materiel Command, until reassigned.

Brig Gen George H. McBride, who held the dual AVCOM responsibility, is now deputy CG of the Army Missile Command, Huntsville, Ala.

General Traylor has served in staff logistics positions with Military Assistance Advisory Groups in Bonn, Germany and in Vietnam. He also held assignments as special assistant to the Army Chief of Ordnance and as a division chief with the Deputy Chief of Staff for Logistics, HQ DA.

Educated at the University of Oklahoma and Texas Western College, he started his Army career in 1940. During World War II he served in Europe, where he conducted an intelligence survey of German coastal defenses in Normandy, and was later assigned to the Philippines and Japan.

His decorations include the Legion of Merit with OLC, Army Commendation Medal and Vietnamese Army Distinguished Service Medal.

WES Designates Anklam as Deputy Director

Lt Col Frederick M. Anklam reported for duty as deputy director of the Waterways Experiment Station (WES), Vicksburg, Miss., following promotion of the former deputy director, Col Levi A. Brown, to director.

Lt Col Anklam reported to WES after a year with HQ U.S. Army Engineer Command, Vietnam (Provisional), and the recently organized U.S. Army Engineer Construction-Agency, Vietnam.

Other assignments have included duty as construction and senior engineer adviser to the Chief of Engineers, Chinese Army in Taipei, Taiwan; commander at Camp Century on the Greenland Icecap; company commander of a troop unit in Germany; and logistics staff officer for the former U.S. Army Polar Research and Development Center.

In 1945 he entered military service with the Air Weather Service, U.S. Air Force. Graduated from the U.S. Military Academy in 1954, he later served as faculty member in civil engineering in the Department of Military Art and Engineering. He holds an MS degree in civil engineering from the University of Illinois and has done graduate work in operations research and industrial engineering at New York University.

He is a registered professional engineer in the State of Illinois, an associate member of the American Society of Civil Engineers and a member of the Society of American Military Engineers. Among his awards and decorations, he holds the Legion of Merit, Army Commendation Medal, Vietnam Service Medal and the Republic of Vietnam Campaign Medal.

WATERWAYS EXPERIMENT STATION Director Col Levi A. Brown congratulates newly assigned Deputy Director Lt Col Frederick M. Anklam after presenting him the Bronze Star Medal for meritorious service in Vietnam.

Kudos

MERITORIOUS CIVILIAN SERVICE AWARD. *Kenneth A. Linell,* chief of the Experimental Engineering Division of the U.S. Army Terrestrial Sciences Center, Hanover, N.H., recently received the Army's second highest civilian employe award. He was cited for supervisory research which contributed significantly to military construction in the arctic and subarctic areas of Canada, Alaska and Greenland.

LEGION OF MERIT. *Col Harry L. Bush* received the LOM for performance of duties as CO of the U.S. Army Aviation Materiel Laboratories (AVLABS), Fort Eustis, Va., from 1966–68.

AVLABS is now directly subordinate to Col Bush, who was recently assigned as deputy commander for Research, Engineering and Data at the U.S. Army Aviation Materiel Command (AVCOM), St. Louis, Mo.

Col Ephraim M. Gershater, CO of Fort Detrick, Md., was awarded the LOM in recognition of his service as a member of the Requirements and Development Division, Plans and Policy Directorate, Office of the Joint Chiefs of Staff.

Col Gershater held the position from August 1966 until he assumed command of Fort Detrick, Md., on July 1, 1968. Maj Gen Frank G. White, CG of the U.S. Army Munitions Command, presented the award.

Lt Col Charles E. Ramsburg was presented the LOM by Deputy Chief of Research and Development Maj Gen Robert E. Coffin. He was cited for his services as a staff officer, executive officer, and chief of the Behavioral Sciences Division from 1965–68, upon his recent retirement.

His citation commended him for outstanding monitorship and coordination of a very large and complex contract program which contributed in large measure to the immediate response and successful completion of critical research requirements.

Lt Col Gordon C. Conklin also was awarded the LOM by General Coffin in recognition of his performance as military adviser to the Human Resources Research Office, and as chief, Human Factors Branch, Behavioral Sciences Division, from 1965–68.

He was honored for his performance which contributed greatly to progress and advancement of Army research and development in such important fields as training, training devices, man-machine performance and manpower management.

Lt Col Robert F. Franz Jr. received the LOM for his significant contributions to international programs of chemical and biological defense while serving as chief of the Chemical-Biological Branch, OCRD.

A career chemical officer, Lt Col Franz is now serving as director of the Defense Development and Engineering Laboratories at Edgewood Arsenal, Md.

Maj Thomas C. West received the LOM for service at AVLABS for over three years as an aeronautical engineer, an experimental test pilot and chief, Flight Research Branch, Applied Aeronautics Division.

ARMY COMMENDATION MEDAL. Two former captains at the U.S. Army Aviation Materiel Laboratories (AVLABS), Fort Eustis, Va., received the ACM for their military service at AVLABS prior to their return to civilian life.

Dr. George W. Bowling, former aeronautical engineer in the Safety and Survivability Division, was commended for his performance as project engineer for the emulsified fuels program at AVLABS and for his research on prevention of postcrash fires in aircraft accidents.

Dr. Emory S. Conyers, former chemist in the Physical Sciences Division, was commended for outstanding leadership in the successful AVLABS development of whiskerized graphite fiber-reinforced composite materials, which will lead to lighter, stronger and more economical aircraft structures.

Plastics Expert Retires With 28 Years at MERDC

One of the pioneers in the use of plastics for military structures, Swante B. (Bert) Swenson, retired recently after more than 30 years of U.S. Government service.

Twenty-eight of those years he was employed at the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., where he retired as chief of the Model Shop and assistant chief of the Developmental Fabrication Division.

The Model Shop gained recognition throughout military and industrial circles for its precise models and outstanding exhibits on Engineer equipment. Later, Swenson's work on a "Buildings in Barrels" program gained much attention in the plastics industry.

This concept involved the field fabrication of buildings made of foam sandwiched between sheets of fiberglass or aluminum. These experimental buildings have been used in climatic extremes, ranging from the Greenland Icecap to Vietnam.

In 1945, he received the Army's highest civilian award, the Exceptional Civilian Service Medal, for producing vital World War II models, precision instruments and camouflage equipment. In 1962, his work on the Buildings in Barrels program earned the center (then the Engineer Research and Development Laboratories) an award from the Society of the Plastics Industry.

Swenson authored a number of articles and papers and presented several reports at annual meetings of the Reinforced Plastics Division, Society of the Plastics Industry on his plastics concept.

Prior to his retirement, he was preented a Department of the Army Certificate of Achievement in recognition of his "dedication, devotion to duty and industry" during his 30 years of service.

Swante B. Swenson

Highly Mobile Air Conditioner Type Classified for Production

An 18,000 Btu/hr. trailer-mounted air conditioner, designed to meet urgent requirements for complex mobile electronic systems for field use has been Type Classified by the Army for limited production.

The unit was developed by the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. It employs such Military Standard items as the 18,000 Btu/hr. multipack air conditioner and a 5-kw. gasoline-engine-driven generator mounted on the ¾-ton trailer. Flexible ducts are used to transfer the conditioned air to the shelter.

This highly mobile unit is 154½ inches long, 73 inches wide and 67 inches high. In addition to providing environmental control in mobile electronic systems, the unit is suitable for general purpose use.

Keeping Pace With Modern Trends

Margaret Thornton 'Builds' Edgewood Library

Through 27 years of service in the technical library at Edgewood Arsenal, Md., head librarian Margaret B. Thornton has kept pace with modern trends of library science while accenting economy of operations.

Any preconceived vision of dusty tomes and a musty, crotchety librarian with pince nez can be dispelled immediately by a quick look at the orderliness and availability of information on microfilm or magnetic tape.

Miss Thornton has kept the library moving from old to new to meet successfully the demands of modern research. She has been officially recognized for her steady course and foresight in library management with an Army Incentive Awards Program Special Act or Service Award, citing her for ". . . establishing new systems, creating its new look, selling modernization to the users, and initiating substantial management improvements. . . ."

The justification for this award credits her efforts with saving the government more than $5,000 in reduced maintenance on books, in screening and destroying excess library material, and by consolidating holdings.

The Edgewood technical library today is recognized as a highly efficient model in information sources on chemical agents and in many other scientific disciplines. It serves Edgewood's Research Laboratories, the Weapons Development and Engineering Laboratories, and Defense Development and Engineering Laboratories—the primary R&D facilities of the Department of Defense for chemical capability as well as protective methods, devices and procedures.

The library has been a major part of Miss Thornton's life since 1941. This major activity of the Technical Support Directorate serves the special needs of more than 800 scientific and technical personnel from arsenal activities, defense contractors and research grantees with a need-to-know come from far afield.

The present shelf stock is approximately 50,000 volumes, supplemented by 360,000 technical reports, 32,000 of which are also on tape. About half of these reports cover chemical agents, munitions and related areas investigated at Edgewood between 1918 and the present.

Some 2,000 books are added annually and approximately 60,000 are circulated. Among recent acquisitions are 16mm microfilm cartridges from the Chemical Abstracts Company containing some 3,750,000 abstracts generated by the company from 1907 through 1966. They made up volumes 1–65 of the hard copies which had required 75 feet of shelf space.

Microfilm of all the journals published by the American Chemical Society are on order for a further saving of 164 feet of shelf space. A reading room for microfilm, partitioned from the rest of the library, contains more than 700 film cartridges available to the researcher.

Long runs of important journals are kept on microfiche (film cards), including one journal dating back to 1830. Microfiche copies are received regularly from NASA and AEC.

Industrial literature represents about 10,000 commercial firms in the form of trade catalogs and descriptive literature on new products.

The Selective Dissemination of Information (SDI) computer system scans automatically more than 2,000 new technical documents twice monthly and prepares a "tailored" listing of pertinent abstracts.

Margaret B. Thornton

Some innovations of recent vintage are in accord with the tremendous advances in methods of handling technical information within the past decade, but it has been the constant devotion and library science knowhow of the continually progressive librarian that has over a quarter century systematically developed Edgewood's library as a leader in its field.

ATLIS Stimulates Publication of Federal Libraries Guide

ATLIS (Army Technical Library Improvement Studies), one of the major projects in the Army Scientific and Technical Information Program assigned to the Office of the Chief of Engineers, has stimulated publication of the first *Guide to Laws and Regulations on Federal Libraries.*

Produced by the Library of Congress in agreement with the Army and the cooperative effort of other U.S. Government agencies, this 862-page document came off the press early in September. The Library of Congress catalog number is 67–13016 and the price is $24.95. The publisher is R. R. Bowker Co., 1180 Avenue of the Americas, New York, N.Y. 10336.

Acknowledgement is made in the preface to the initial grant of funds for the study provided by the Army's ATLIS Project. This had its origin six years ago in a proposed scientific and technical information program of 23 task areas developed by an ad hoc study group organized by direction of the Chief of Research and Development. The ATLIS Program is monitored by the Information Programs Branch, Data Management Division, U.S. Army Research Office.

The foreword effectively justifies publication of the *Guide to Laws and Regulations on Federal Libraries* as a long-needed contribution to improvement of operational procedures within federal libraries, as follows:

"The performance of any governmental activity on appropriated funds must be authorized by a specific statute or through interpretation by some general statute. For this reason it is especially important for managers of service organizations like libraries—the authority for which is based frequently upon a statute that does not even mention the specific service—to know the source of their authority and the manner in which governmental regulation allows them to perform their service.

"This knowledge is particularly difficult to obtain in the case of most federal libraries because the laws and regulations which govern their operations are scattered throughout the United States Code, the Code of Federal Regulations, Armed Services Procurement Regulations, and regulations issued in the various government agencies involved.

"This absence of a specific charter for federal library operations is responsible, without doubt, for many of the inconsistencies in federal library procedures. It is a major handicap in uniform, efficient library services throughout the government.

"The present compilation and guide, therefore, should be of considerable significance in the efforts to improve federal library and information services. It should become a basic reference tool for all federal librarians and others interested in the provision of library and documentation services in the Federal Government."

USA TACOM Pursues Low-Vulnerability Tire Research

By Roger Kirk

Low-vulnerability tire concepts are being investigated by the U.S. Army Tank-Automotive Command in Warren, Mich., in an effort to discover a practical solution to this "Achilles heel" of tactical and combat wheeled vehicles.

About a dozen years ago, USATACOM (then the Ordnance Tank-Automotive Command, or OTAC) solicited a number of tire companies to submit proposals for building a low-vulnerability military tire.

The concept was that this tire would conform as closely as possible to the conventional military tire, but would exhibit run-flat capabilities if punctured. The idea was that this run-flat capability would obviate the cumbersome necessity of having each wheeled vehicle carry a spare.

Four such tires, one each from four different companies, were purchased and tested statically and dynamically for possible acceptance. None was accepted, although one did exhibit great promise. Its penalty was excessive weight—more than the military deemed it could bear at the time on any of its vehicles.

Taking advantage of this information, researchers modified the suspension, axles, and power train of an armored escort vehicle to complement the tire's weight. The U.S. Army is now buying some of these vehicles, with the run-flat tires as an integral part of the package.

Vehicles being studied are combat personnel-carrying cars, and they are the only wheeled vehicles in the Army's inventory equipped with run-flat tires today. A sectioned view of the tire, showing its very sturdy sidewall and triple bead bundles, is shown in Figure 1.

In the 14.00–20 size used on the armored escort car, the tire plus tube and flaps weighs approximately 335 pounds. It is a 12-ply-rated nylon cord carcass with a deep directional tread and a heel-to-toe bead width of 3½ inches.

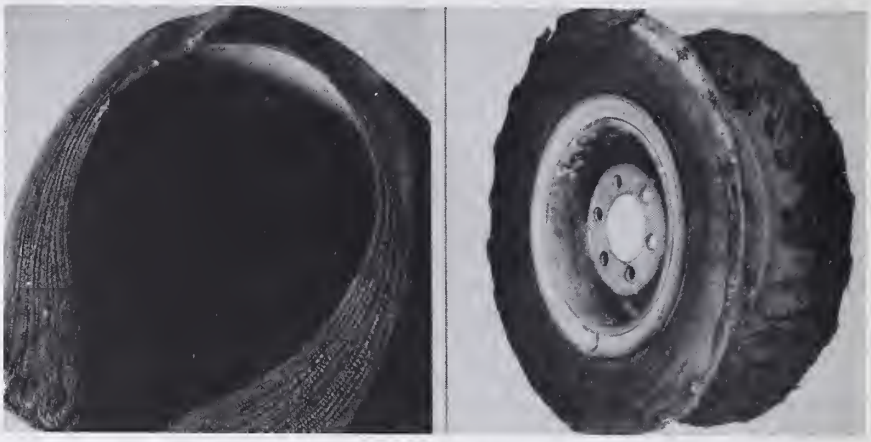


Fig. 1. Sectioned view and sidewall stubs of run-flat tire.

When the tire is deflated, the sidewalls bend outwardly and hinge just lateral to the shoulders in the sidewall (the shoulders being the inner and outer edges of the tread).

As the vehicle proceeds on the flattened tire, the tread eventually breaks off and the wheel continues to roll on the tough sidewall stubs. An illustration of what the tire looks like in this condition is shown in Fig. 1.

Run-flat capability of this tire is 25 to 50 miles, depending upon terrain, speed, load and other variables, although the vehicle contractor claims a peak performance of 75 to 100 miles. The negative factors are its excessive weight, its extreme premium price through the prime contractor, and its direct unavailability to the military.

Several substitutes for this combat tire are under investigation. One of the most promising is a pneumatic tire which mounts and behaves similar to a conventional tubeless tire, but when deflated behaves much differently.

When normal air pressure decreases due to a puncture, the sidewalls fold inwardly, exerting pressure on the beads against the rim flanges rather than toward the center of the rim. This action tends to hold the tire on the rim and allows the rim to rotate on three layers of rubber—the tread and two layers of the folded sidewall.

Weight of the experimental tire is about equal to the conventional bias ply tire of the same size, so that there is no weight penalty. This tire has exhibited the capability of running deflated in excess of 100 miles, the manufacturer states.

USATACOM personnel have driven an M-151 "Mutt," with one, two, three and four of the 7.00–16 size in the deflated condition on the Detroit Arsenal grounds. Figure 2 shows both an inflated and deflated version of the tire and also a cross section of the deflated version.

These tires are being tested on vehicles at Pecos, Tex., in the 7.00–16 size, and are being manufactured for USATACOM in the 16–20 size.

Another low-vulnerability concept under contract development is a filament-wound, glass-fiber, reinforced plastic *non*pneumatic tire in 7.00–16 size.

Wound in a toroidal shape, like a doughnut and mounted on a split-rim fiberglass wheel, the tire will be equipped with rubber treads and sidewalls and appear the same as an ordinary conventional tire.

Assets are its light weight, high strength, and the fact that, being nonpneumatic, it can be shot through in combat without flattening.

Negative factors are that it is very

Roger Kirk is project engineer on low-vulnerability combat tires, Materials Division, Vehicular Components and Materials Laboratory, U.S. Army Tank Automotive Command (USATACOM), Warren, Mich.

Prior to his work with the government, he was employed by the Chrysler Corp. as chief chemist in the Delaware Tank Plant from 1952 until 1956. He then served as group supervisor of chemical processes and managing engineer of the Chemical Engineering Department at Chrysler's Missile Division in Detroit until 1963.

He joined USATACOM in 1966 after employment as technical director of auto and truck body rustproofing at the Ziebert Process Corp. in Detroit.

Kirk received his bachelor's degrees from Franklin and Marshall College in Lancaster, Pa. (1946), and has completed graduate courses at Rutgers University.

springy, does not appreciably deflect, and produces a narrow footprint. This limitation means that it would be unsuitable for sand or mud.

An ellipsoidal shape may be contemplated for development to produce a more favorable footprint in soft or plastic terrains if the fiberglass tire proves to be otherwise a highly satisfactory answer to puncture invulnerability.

A view of the filament-wound unmounted tire is shown in Figure 3. Also shown is the mounted tire with tread and sidewall rubber applied.

Another nonpneumatic tire of interest to the military is a recently developed foam-filled tire. It performs very much like a conventional tire but can withstand several through-penetrations from small-arms fire.

USATACOM personnel drove a passenger car equipped with these tires in a test. One of the front tires had been penetrated by several 30-caliber bullets, but the car still handled very well. The foam in this tire is different from foams heretofore experimented with, in that developers report it is resistant to heat at sustained speeds of up to 70 mph.

One of its penalties is that it is considerably heavier than desired. It has a density of 40 lb./cu. ft., which makes the tire nearly three times the weight of the conventional tire of the same size.

In spite of this objection, USATACOM is determining, with the developers, the feasibility of filling government-furnished tires of two different sizes for laboratory evaluation.

Another concept to be investigated is the possibility of developing a less dense cellular material offering approximately the same thermal resistance and small-arms invulnerability.

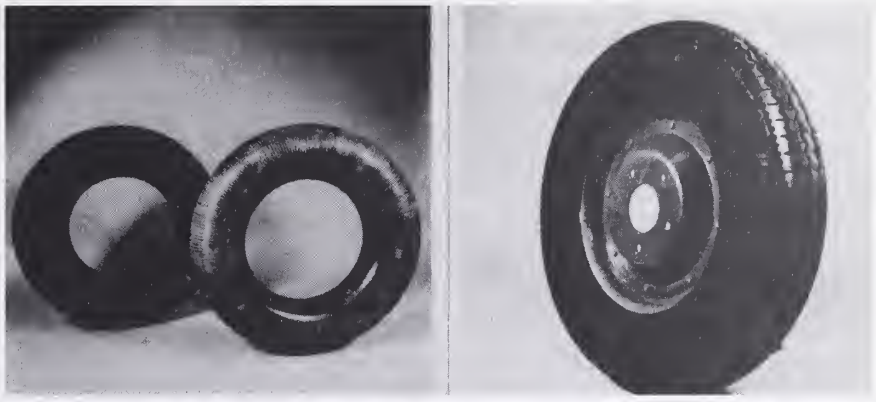


Fig. 3. Filament-wound tire and mounted tire with tread and sidewall rubber.

Two other pneumatic low-vulnerability tire concepts are of high interest to USATACOM researchers. One concept is a development by an eastern research laboratory whereby a tubeless carcass is filled with gas-pressurized polymer film spheres and then inflated to the desired pressure.

Should the tire be punctured, the lost air is partially compensated by the expansion of the previously compressed pressurized spheres, which keep the tire from going flat. The spheres are very light so that the increase in total tire weight should not be a negative factor.

What could be negative factors are (1) thermal degradation at highway speeds of 50 mph or more, (2) collapse of spheres due to either rubbing (abrasion) or failure of adhesive bond between joined, polymer film, preformed hemispheres, and (3) mass escape of spheres due to large cuts or tears in the carcass.

The other pneumatic tire concept being studied, one of very recent development, is a tubeless tire with a cordless carcass and a rather thick tread. The weight of this cordless tire is actually less than that of a standard tire of the same size. Its plunger penetration resistance is twice that of the standard bias ply tire.

The unusual characteristic of this tire is that it will support 60 percent of its load *after* deflation, meaning the air supports only 40 percent of the load. This compares with a standard tire which supports only 10 percent when deflated, 90 percent of the load support coming from the air.

USATACOM is aware of many concepts aimed at providing run-flat or "get-home-capability" tires, and has investigated many. Those deemed most valid to date have been briefly discussed here. The search to improve safety, reliability, and low-vulnerability, without sacrificing performance, will continue.

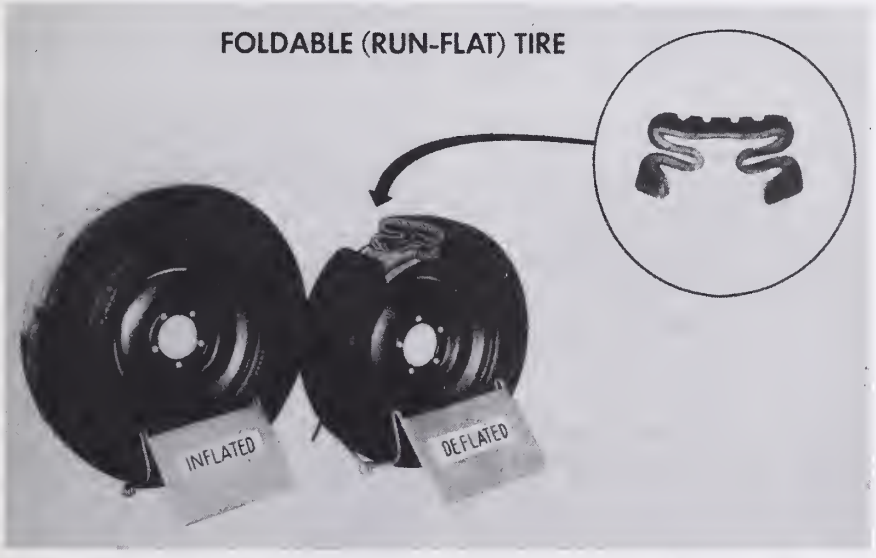


Fig. 2. Foldable run-flat tire and cross section of deflated version.

MERDC Develops Soil Colorant For Use in Earth Camouflage

As part of its program of developing improved camouflage materials and techniques the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., has developed an experimental soil colorant for scarred earth.

Intended for use where soil scarred by construction or erosion must blend into the surrounding terrain, the soil colorant is an inexpensive water-emulsion coating with a latex base.

Capable of penetrating and sticking to all soils, the colorant dries in 15 to 20 minutes to provide a durable coating that also prevents dust.

Helicopter and ground vehicles can spray the camouflage colorant which comes in light green, earth brown, earth yellow, sand and desert sand colors.

New Unit Record Concepts Viewed for ADP Applications

By Donald D. Curry

Unit Records maintenance problems in the harsh environmental conditions to which punched paper card systems are subjected in Southeast Asia might be alleviated greatly by a new concept developed by the U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J.

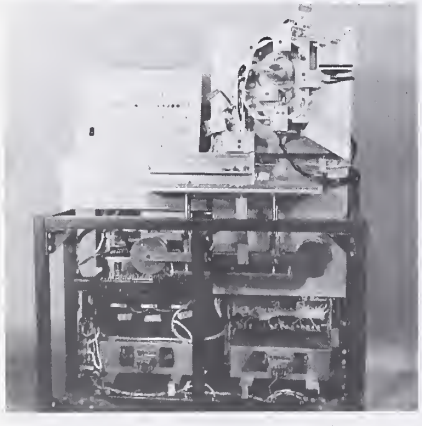
Completion of two exploratory development contracts recently proved the feasibility of the concept. Each of the contractors, UNIVAC of Blue Bell, Pa., and Magnavox Research Laboratories, Torrance, Calif., pursued a different approach toward implementing the Unit Record Concept under an agreement with ECOM.

Problems of maintenance of processing equipment and rapid deterioration of punched paper cards in the climatic and handling environment of conditions in South Vietnam have been acute. The situation has served to accentuate the Army's consideration of possible changes to correct long-recognized disadvantages, limitations and deficiencies.

The ECOM concept is viewed as a first step toward that goal. Recognized is the fact that vast improvements in computers in recent years have far outstripped progress in development of input/output media. This is especially true when related to the tactical environment in Vietnam.

Punched cards have been vulnerable to the weather and lack of proper handling conditions in many instances in Vietnam, such as storage in "tub files" in tents, where they are subjected to foreign matter (sand and dust) that gets into processing equipment to compound maintenance problems and cause rapid deterioration.

Another disadvantage of present punched card equipment is that many machines are too slow for their functional uses. This speed incompatibility requires elaborate buffering systems, programing time and computer time, thereby increasing cost and lessening overall computer system efficiency.



Magnavox Unit Record Equipment

To reiterate, punched card systems for the military just are not doing the job. Input/output (I/O) equipment is the major cause for down time, requiring precise adjustments and frequent periodic preventive maintenance by trained personnel. The equipment is expensive, bulky, heavy and requires large amounts of power.

In the same light, computers today have been miniaturized through smaller circuits and many unique ideas have been incorporated into the electronics. Card handling equipment, however, still contains a lot of mechanical parts. In the Army's tactical ADP systems, the I/O equipment represents the major weight factor in a shelter configuration and, in some instances, exceeds the weight capacity.

While military computers continually are becoming smaller and faster, I/O equipment remains inflexible. Equipment and the low density of the card simply do not match the functions they are trying to accomplish. Combined with very slow processing time, these shortcomings definitely accentuate the need for replacing the present ADP punched paper card.

In a military field combat environment, certainly a more functional form of Unit Record is required—one that meets stringent requirements of combat and provides a higher character density in addition to imaging and legal considerations. Recognition of this urgent need provided the basis for the ECOM developmental program for a new Unit Record Concept.

Desired characteristics and key parameters were defined at the outset, based upon functional applications. An Operations Research approach was used to determine the optimum capacity, physical size and format of the proposed new Unit Record. Four areas having the greatest potential for future use of Unit Records were studied—Personnel, Logistics, Military Police, and Command and Control.

Applications in these areas, it was decided, could be considered typical of the whole Army. From this research and analysis, a new Unit Record Concept was evolved. The Unit Record is defined as a separable document (that is, it can be removed from and put back into the same file containing other similar documents) which contains information about one item and is both man- and machine-readable. The concept involves:

- The Machine-readable Sector, an area possessing at least 1,000 characters of machine-readable information.
- The Man-readable Sector, an alpha-numeric section whose minimum capacity is 150 characters.
- The Image Sector, on the order of 1.5 inches by 2 inches.
- The Authentication Sector, about 0.5 by 2.5 inches, for signatures.

This new Unit Record Concept with its four functional areas can be tailored to any application. This is most important. The concept calls for maximum flexibility for different classes of users. Certain users could require a combination of all four functional

Donald D. Curry is project engineer for developing new Unit Record techniques at the U.S. Army Electronics Command, Fort Monmouth, N.J. He is studying exploratory techniques in data storage, imaging, printing and handling related to Unit Record (punched card) processing, paper tape usage and miniaturized printers. He has a BS degree in electronics from Purdue University.

Univac Unit Record Equipment

formats. This points the way toward a technologically updated Unit Record for the Army.

One important aspect of the concept, at least to the military, is a capability for manual handling. The Human Factors Group at Fort Monmouth conducted a series of tests on various sizes of cards for manual handling, leading to a conclusion that a standard card should be on the order of 3 x 5 inches. Great savings could be achieved in physical storage space requirements and in the size of handling equipment for such a card.

Widespread experience has shown that as basic disadvantage of the punched cards now used is that each unit is limited to 80 to 90 characters of data.

When a Unit Record exceeds these low limits, use of more than one card is necessary. Consequently, unique identification must be repeated on each card relating to a record of data. This decreases density of data and at the same time contributes to the bulkiness of the file. Use of the 1,000-character minimum Unit Record will eliminate most of these multiple trailer card situations.

Basic characteristics of the two Unit Record Exploratory Development projects conducted under the contracts with UNIVAC and the Magnavox Research Laboratories are shown in Table 1. Major objectives are:

- More efficient storage of data on the media (1,000 characters on a Unit Record, a more than tenfold increase); and reduction of the size of the Unit Record card from 24 square inches to 10 square inches.
- Media that would be usable in all military environments. Both contractors chose Mylar as the base for the new record. This material is impervious to factors that render paper punched cards useless, such as high humidity, water, tearing, thickening of the edges, expansion, etc.
- Increased writing and reading speeds so that the data transfer rates will be closer to that of new ADP equipment (reading and writing speed of machine-readable data on the order of 30,000 characters/second.)
- Simplified handling mechanisms for smaller, lighter and more reliable equipment using fluidic controls.

The importance of air fluid handling with no moving parts for Unit Records cannot be overemphasized for operation in a military environment. Fluidic devices provide greater reliability than electromechanical devices and have other advantages:

- Free from contamination. Fluidic circuits, completely enclosed and operating on filtered air, will minimize contamination. There will be no dust or dirt particles to keep relay contacts from closing.
- Free from vibration. Because there are no moving parts, the fluidic control is immune to most vibration frequencies and intensities.
- Free from environmental disturbances. Magnetic fields, ionizing radiation, G-forces (acceleration), temperature changes, moisture, and stray r-f signals have no effect on fluidic controls.
- Superior reliability. Since fluidic devices have no moving parts except the fluid itself, there is nothing to age, nothing to burn out, nothing to go out of order. And think of all the lubrication and order maintenance eliminated

In spite of these advantages, the fluidic system still requires considerable development and does not eliminate the possibility of utilizing more conventional card handling techniques. Due to the construction and nature of the Unit Record itself, this still would offer tremendous speed, cost and reliability advantages over punched cards and card handling equipment.

Under the Unit Record Concept developed by ECOM through the two feasibility study contractors, one document will be able to store any form of data needed by the military—data in machine- and man-readable form, image, pictorial, graphic information, and signatures for legalization.

From talks with various potential military users, i.e., Personnel, Logistics, Military Police, Command and Control, it has been determined that they all desire a significantly newer method of entering data to a data processor and being able to utilize the output more effectively.

The Unit Record Concept has received favorable response from these people. It now appears that adoption of such a system would solve many of the existing data problems for users. Some possible uses other than normal military Unit Record personnel and supply records might include financial information, bibliographic data for technical reports, engineering data, special project data, abstracts of technical papers and reports, etc.

In effect, a new Unit Record technique could conceivably revolutionize the entire ADP community.

Table 1

Univac	Characteristics of Unit Record Equipment	Magnavox
2.4 inches by 4 inches, 5 mil Mylar, electroless-plated on both sides with a thin film of magnetic nickel-cobalt alloy.	*Medium*	*3 inches by 4.5 inches, 7.5 mil Mylar. The upper 35 mm by 4.5 inch section of the record has a magnetic oxide coating. The lower 35 mm by 4.5 inch section has a diazo emulsion film coating.*
1024 characters at 400 bits/inch. Magnetic, reusable.	*Machine readable sector*	*1016 characters at 250 bits/inch. Magnetic, reusable.*
180 characters. Impact printing. Special inks for reusability.	*Man readable sector*	*80 characters at 10 characters/inch. Space available for 320 characters. The characters are recorded as a magnetic facsimile of the characters and are rendered visible by means of a developer or a small viewer. Reusable.*
Proposed 35 mm microfilm (aperture card technique), nonreusable.	*Image section*	*Proposed 35 mm microfilm form on the diazo emulsion, nonreusable.*
Accepts ball-point signatures.	*Authentication*	*Abraded surface will accept ball-point pen signatures.*
All fluid (air) transport. The transport will employ all fluid techniques in picking, accelerating, transporting past the read-record head, and gating unit records, along with cartridge loading and unloading.	*Handling means*	*Mechanical pneumatic means.*
5 per second at 75 inch/sec. The recording-reading rate of the machine-readable sector will be approximately 30,000 characters per second.	*Handling rate*	*10 per second at 120 inches/sec. The recording reading rate of the machine-readable sector will be approximately 30,000 characters per second.*
1,000 unit records, which is over 1,000,000 characters.	*Contents of cartridge-magazine*	*2,000 unit records, which is over 2,000,000 characters.*

Former Kwajalein Commander Assigned to Sentinel System

HQ U.S. Army Munitions Command has selected Col Frank C. Healy, former commander of Kwajalein Missile Range in the Pacific, as project manager for munitions for the Sentinel Ballistic Missile Defense System.

Prior to the Kwajalein assignment, he was chief, Safety and Storage Division, U.S. Atomic Energy Commission, from 1963 to 1966. He served at Letterkenny Army Depot from 1961 to 1963 as director, Supply Operations, following a 3-year tour as chief, Special Weapons Communications Zone.

Col Healy was graduated from the University of Massachusetts with a BS degree in 1939 and received an MS degree in 1948 from the University of Illinois.

Policy Expedites Clothing, Equipment to Field Troops

***By Lt Col Rufus E. Lester, Lt Col Ernest A. Vuley and Charles N. Gardner**

In testimony before the U.S. Senate Armed Services Committee prior to a recent change in Department of the Army procedures, Director of Defense Research and Engineering Dr. John S. Foster Jr. stated:

"Some of our most important-though relatively inexpensive activities are in the development of personal equipments, lightweight armor and food items for soldiers."

Army regulations provide policies and procedures associated with the myriad of details that apply to the identification of requirements, development of materiel and adoption of equipment through type classification.

Many of us who have been involved in Army efforts regarding individual clothing and equipment have realized that there has been an urgent need to streamline the procedures for this type of equipment.

One may ask why procedures for this type of equipment should be singled out. Reasons include:

- Individual clothing and equipment is less complex from a developer's viewpoint than many other equipment systems (e.g. vehicles, weapon systems).
- The items are largely low in dollar value per unit and high density in nature of handling.
- Items normally present a lower fielding risk than complex equipment.
- The fact that the items are used by virtually all soldiers demands accelerated fielding because of the number of personnel who will benefit.

The Department of the Army published a letter of instruction July 29, 1968, to expedite fielding of combat and functional type individual clothing and equipment excluding small arms. Main features of this procedure are:

- The United States Army Combat Developments Command (USACDC) will use a "Letter Requirement-Quick Reaction (LR-QR)" as a requirements document instead of a QMR (Qualitative Materiel Requirement) or SDR (Standard Development Requirement). The LR-QR requires less information than a QMR or SDR and USACDC will process the document in a more streamlined manner.
- The United States Army Materiel Command, the developer, will conduct one In-Process Review only, which will be held when the prototype is considered to offer sufficient promise to qualify for evaluation under field conditions.
- In-Process Review Minutes will include a recommendation to proceed with Limited Production Type Classification and procurement of sizeable quantities for field evaluation.
- Assistant Chief of staff for Force Development will staff the In-Process Review Minutes and prepare the reply that will include authority for procurement of operational quantities, approval of Limited Production Type Classification and instructions regarding the evaluation.
- Based on the completed evaluation, ACSFOR will type classify the item Standard A, as applicable, and the Deputy Chief of Staff for Logistics will accomplish necessary coordination associated with procurement and issue.

The above streamlined procedure should truly expedite preparation and staffing of requirement documents, development, evaluation and fielding of operational quantities.

The Department of the Army procedure clearly identifies that low-dollar-value, high-density, low-risk items badly needed for all soldiers should not be developed and fielded under the same constraints that are necessary for complex equipment.

**Lt Col Rufus E. Lester Jr., now assigned to HQ U.S. Army in Europe, was in the Combat Materiel Division, Office of the Chief of Research and Development. Lt Col Ernest A. Vuley is a staff officer in the Service Support Systems Directorate, Office of the Assistant Chief of Staff for Force Development, HQ DA. Charles N. Gardner is acting chief of the Individual and General Equipment Directorate, HQ U.S. Army Materiel Command.*

Pioneer Missile Scientist Takes GWU Professorship

Guenther Hintze, one of the U.S. Army's pioneer missile scientists who has spent most of his civil service career at White Sands (N. Mex.) Missile Range, has retired to accept a professorship at George Washington University, Washington, D.C.

"I have spent more than 25 years researching, testing and in the application of theory in missile development," he explained. "Now, I want to pass onto others some of the things I have learned."

Teaching is not a new field to the German-born scientist who came to the United States in 1945 as a member of Dr. Werner von Braun's original "Paper Clippers." When he retired he was director of the Analysis and Computation Directorate at White Sands Missile Range.

In addition to full-time missile work, he has taught computer and system analysis courses during his spare time at the Universty of Texas at El Paso. He also was an energetic exponent of the WSMR graduate study program with New Mexico State University, for which he was awarded an honorary doctor's degree by NMSU in 1962.

Guenther Hintze

Although he has written dozens of scientific papers and reports, Hintze published his first book in 1966, *Fundamentals of Digital Machine Computing*, a basic text for training computer users. (See *Army R&D Newsmagazine*, September 1966.)

Born in Breslau, Germany, he received his master's degree in electrical engineering in 1929 and began his career with the German Army in the infancy of missile development in 1942 after working 10 years as an engineer in the electronics industry. By the time of the German surrender, he had become one of the key figures in Hitler's V–2 missile program at Peenemuende.

In America, he was assigned with Dr. von Braun's group to spearhead the U.S. Army missile program then beginning at the newly established White Sands Proving Ground. His work included checkout and testing of facilities and procedures for the reassembled German V-2 and then for the Hermes II missile.

In 1949, he went to Redstone Arsenal, Ala., with Dr. von Braun's group. He returned to White Sands about two years later to resume work in flight simulation and was instrumental in establishing the WSMR environmental test facilities. He was responsible for the planning, development and establishment of the Flight Simulation Laboratory in 1958.

Picatinny Inventors Develop Flare 'Chromacorder'

Elimination of any guesswork in identifying the "exact" color of flares used as signals to call for specific action during operations in Vietnam is possible with a new instrument developed at Picatinny Arsenal, Dover, N.J.

Factors such as the surrounding light, distance to the flare and the color quality of the flare itself might cause misinterpretation of the color of the flare intended to call guns, mortars, bombs or troops into action.

After several years work, Paul Kisatsky, physicist, and Louis Szabo, electronic engineer, have produced what they call the "flare chromacorder" which can be used to measure quantitatively the color of flares.

One of the problems that faced the developers was how to assign numbers to anything as subjective as color, i.e., peach, amber, sky grey, lark blue, etc. It is well known that by mixing two or more colors, a third color can be produced. Also, it is fairly well known that every color can be matched by the mixture of no more than three other basic colors called "primaries."

The chromaticity coordinate method of quantitatively describing colors by three numbers one for each of three primaries was devised in 1931 and is now universally recognized in all modern color industries, such as textiles, paints, dyes, etc.

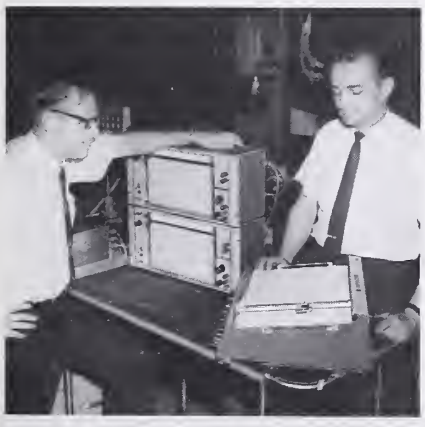
The chromacorder is made up of a bank of 40 photocells, each within a specific colored filter. When colored light from a flare falls on the photocell "eye" (pickup head), 40 electric signals simultaneously feed into the computer box—the brain of the instrument.

Here the data is processed and several operations of multiplication, addition and division are automatically performed. Three electric signals (representative of the three primary values) are available as the final measurement, while the flare burns. If the color of the flare changes during burning time, so do the primary values.

A unique feature of the instrument is that it is mathematically designed; no two instruments are exactly identical. Exact characteristics of the commercial photocells and filters used in the instrument are individually measured.

This information is then used in a computer program at the arsenal, which, after solving as many as 40 simultaneous equations, yields the optimum design parameters then engineered into the device.

This mathematical procedure and computer optimization combine to make the instrument successful. Previous attempts by industrial concerns to perform the same function have not been satisfactory.



CHROMACORDER DEVELOPERS Paul Kisetsky (left) and Louis Szabo display major parts of new instrument that instantaneously measures and records the true color of burning flares. Both are employed in the Pyrotechnics Laboratory, Feltman Research Lab.

Generals Hurlbut, Durrenberger Exchange Positions

Maj Gen Oren E. Hurlbut and Brig Gen William J. Durrenberger are involved in a swap of positions announced by the Department of the Army.

General Hurlbut will assume command Nov. 18 of the U.S. Army Weapons Command (WECOM), headquartered at Rock Island, Ill. General Durrenberger will vacate this role to succeed him as assistant chief of staff, G–4, U.S. Army, Pacific (USARPAC).

Graduated from the United States Military Academy in 1935, General Hurlbut has served at HQ USARPAC since June 1966. General Durrenberger has served as WECOM commander since October 1966.

From September 1959 to December 1960, General Hurlbut served at the Rock Island installation as the third CG of the Ordnance Weapons Command, forerunner to the Weapons Command. His next assignment was assistant chief of staff, G–4 (Supply and Logistics), Eighth U.S. Army in Korea. In May 1962 he was assigned to HQ U.S. Continental Army Command, Fort Monroe, Va.

General Durrenberger attended the University of Minnesota, where he was born in the city of Wadena, and received a BS degree from the University of Maryland. He has a master's degree in business administration from Syracuse University. His nomination by President Johnson for promotion to major general was confirmed by the Senate in July.

MERDC Tests Prototype Unit Of Molten Carbonate Fuel Cell

Tests of what is believed to be the first self-sustaining molten carbonate fuel cell indicate that the type has possibilities in the Army's program to develop efficient, inexpensive silent power sources.

The prototype unit was built by Texas Instrument, Inc., under contract with the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., to provide an engineering design and a system analysis of a 15-kw. power plant.

Operational characteristics demonstrated the feasibility of the partial oxidation, molten carbonate system fueled by leaded gasoline. After starting, the fuel cell requires only normal refueling service.

The 600-pound, 500-watt prototype unit, however, is about twice the desired size and one-half the power. The proposed long-range development program on the 15-kw. unit will emphasize development of longer life and a better power-density ratio in the fuel cell module.

SCIENTIFIC CALENDAR

15th Technical Meeting of the AGARD Avionics Panel on Techniques for Data Handling in Tactical Systems, sponsored by AGARD and NATO, Amsterdam, Netherlands, Nov 4–7.

International Symposium on Fluidics, London, England, Nov. 4–7.

IEEE North Carolina Affiliation Symposium, Greensboro, N.C., Nov. 6–7.

IEEE Northeast Electronics Research and Engineering Meeting, Boston, Mass., Nov 6–8.

3d Biennial International Symposium on Microelectronics, sponsored by the International Electronics Association, Munich, Germany, Nov. 7.

104th Semiannual Technical Conference of Engineers, Washington, D.C., Nov. 10–15.

Winter Meeting of the American Nuclear Society, Washington, D.C., Nov. 10–15.

International Conference on the Constructive Uses of Atomic Energy, Washingotn, D.C., Nov. 10–15.

Automatic Support Systems for Advanced Maintainability Symposium, sponsored by IEEE, St. Louis, Mo., Nov. 12–14.

Engineering in Medicine and Biology Conference, Houston, Tex., Nov. 17–21.

Magnetism and Magnetic Materials Conference, sponsored by IEEE, N.Y.C., Nov. 17–21.

Photovoltaic Specialists Conference, sponsored by IEEE, Pasadena, Calif., Nov. 19–21.

Conference on Prevention of Microbiological Deterioration of Military Materiel, sponsored by the U.S. Army Natick Laboratories, Natick, Mass., Nov. 19–21.

Conference on Chemical Kinetics, sponsored by the University of North Carolina, Chapel Hill, N.C., Nov. 21–22.

26th Meeting of the Antimissile Research Advisory Council, sponsored by ARPA, Cape Kennedy, Fla., Nov. 25–27.

American Physical Society Fall Meeting, Miami Beach, Fla., Nov. 25–27.

International Aerospace Exposition, sponsored by the Canadian Aeronautics and Space Institute, Montreal, Canada, Nov. 26–27.

Maintaining Reliability During Breakout Procurement

By James D. Cuff

A weapon system is developed by the prime contractor to the best of his ability by using reliability techniques. Let's assume that as long as the prime contractor is responsible for producing the whole system, it will continue to exhibit a high mission reliability.

Problems frequently occur when the time comes for "breaking-out" major items for competitive procurement. Supposedly, the break-out items have complete documentation packages—at least the documentation was adequate when the prime contractor produced it. But what happens to the reliability when the item is produced by the second and third sources?

The reliability probably decreases because all the prime contractor knowledge of fabrication techniques cannot go into the documentation package. Therefore the documentation is not complete as to all the incremental steps in assembly and processes that are essential to assure performance. It is almost impossible to include all these steps and "techniques" in the documentation package.

If reliability cannot be assured through the U.S. Government documentation currently provided to the prospective contractors, how can reliability of critical items be assured throughout production, regardless of production source?

The Army Missile Command, in conjunction with Missiles and Space Division, LTV Aerospace Corp., has evolved *Industrial Reliability Standards* as a method of control in the Lance missile system project. Procurement specifications (documentation) are prepared in detail for each critical assembly. Industrial Reliability Standards are referenced in the specifications as required documents.

The Industrial Reliability Standard consists of three books. Book I, *Test Methods and Procedures*, is composed of four sections: test plans and procedures, report forms and instructions, test schedule, inspection photographs and instructions.

Test plans give an exact test procedure and the sampling rate (number of items to be tested per each lot or 20 items produced) and the data sheets to be used for recording test results.

One Industrial Reliability Standard prerequisite is that the item must have undergone measured overstresses and other reliability testing during development. Test data must be recorded so that it can be used as a base against which to compare production item test results.

The majority of testing is done in four to six steps of increasing overstress severity, allowing for determination of reliability through safety margin analysis. The testing rate and sample size varies from high, normal, to low, depending on performance.

If the reliability from a lot is above the base reliability established during R&D testing, the subsequent lot can go to a lower-sampling size with less testing. However, if the reliability drops below the base, the testing rate and sampling size is increased until the deficiency that caused the low reliability is corrected. The sampling rate and conditions are specified in Book I.

Report forms and instructions list measurements and tolerances or parameters to be recorded throughout testing. The exact format for recording test results is shown. Information can be taken from the forms and used in a computer for comparing test results. The forms will prevent any misunderstandings as to the exact information required from the tests.

The *test schedule* lists the sample size and the sequence of testing required originally to qualify a producer, and the testing rates throughout production. The sampling size and testing rate will vary, depending on whether the safety margin is increasing or decreasing.

If the safety margin decreases to below an acceptable base on two successive lots, the supplier will be required to requalify. Anytime the safety margin (reliability) decreases below that demonstrated during R&D, corrective action must be taken by the producer.

Reliability tests are performed on items selected at random from lots that have already passed Quality Control Acceptance Tests. The reliability tests can cause the lot to be rejected if the safety margin is

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Training Device Simulates M-72 A1 LAW System

Performance of the M–72 A1 LAW (Light Antitank Weapon) system is simulated by a new miniature training device that scored direct hits on stationary targets at a range of 200 meters during recent tests.

HQ U.S. Army Missile Command (MICOM), Redstone Arsenal, Ala., announced that the device gives soldiers realistic experience at considerably less expense than firing normal LAW rounds. Installed in the LAW launcher, it fires an 8-inch-long, ½-inch-diameter rocket equipped with a head that flashes on impact to mark the target hit.

Larry Nicastro, chief of the Small Rockets and Aircraft Armaments Branch, MICOM, and Capt Richard McKinnon of the U.S. Infantry School at Fort Benning, Ga., scored the hits in the demonstration observed by Army military and civilian weapon experts.

Deployed in Vietnam and elsewhere with Army units, the M–72 LAW is a highly versatile weapon that weighs less than five pounds, is shoulder-fired and can be used against bunkers, snipers or field fortifications.

LAW was developed and deployed under MICOM management and subsequently turned over to the U.S. Army Munitions Command. It is being delivered to the Test and Evaluation Command for engineering service tests.

Management of the training device program is directed by Howard Cox of the Land Combat Commodity Office at MICOM. Project engineer is Jim Howison of the Small Rockets and Aircraft Armaments Branch, Development Division, MICOM Research and Development Directorate.

CORRECT FIRING position for M–72 A1 is demonstrated by Capt Richard McKinnon. Equipped with a new training kit, the weapon provides realistic firing experience at considerably less expense than by using normal rounds.

too low, or require that immediate corrective action be taken.

Since testing is expensive, it cannot be used on every major component of a system. This method should be reserved for critical assemblies that are planned for eventual competitive (second source) procurement.

Inspection photographs are taken of the critical steps in assembly (at least 10 photographs for each assembly). Photographs are used by quality control for visual acceptance standards, by production for assembly line personnel training, and by reliability engineers in performing analyses of failed items.

The preceding discussion has described the reliability content of the documentation package. The data analysis system is the real heart of the system, but is the part that will be used only for reliability determinations.

This functional data analysis system is defined in Book II, *Test Analysis Instructions* and Book III, *Automatic Data Analysis System.*

Book II lists the details for manually screening all reliability test data, primarily to ensure accuracy. The data on a specific item will be given a quick look by reliability engineers to determine if it deviates appreciably from previous data.

A large deviation may indicate either test facility problems or a catastropic failure of the item under test. Immediate corrective action then can be taken. If the reported data appears usable, it is transcribed into keypunch cards for entry into the computer. This is the Automatic Data Analysis System (ADAS).

Book III lists the operation of ADAS. Essentially, it consists of an IBM 360 computer, with the "memory" containing the performance data, obtained by R&D testing on the critical Lance missile assemblies—recorded during normal operating conditions as well as from-step-stress tests.

The computer information will be updated continuously from incoming data, and as changes occur to the performance specifications. The computer will compare the test data from the samples with the recorded data and determine if reliability performance specifications are being achieved. The computer also will reflect trends.

Each computer operation is described in detail, along with the prescribed method to be used in analyzing and utilizing the printout. The computer will print out the following information for each data set entered.

- A listing of the test data.
- The ratio of the number of test measurements in the set "in-spec" versus the total number of measurements in the set, S_0/N_0. For go, no-go data, the ratio S_1/N_1 is the ratio of successes to number of tests.
- A listing of the test measurements that are out of specification and identification of the parameter that was violated.
- The results of a statistical test for "outshots."
- The results of a statistical test called the "combined comparison of frequencies test" which analyzes S/N's.
- The mean and variance of the test set.
- The results of the "t-test" analyzing means and "f-test" to analyze variances for significance.
- The results of "runs" analysis that will detect trends and shifts in data that might otherwise be missed by the t and f tests.
- The results of a computation of the current reliability margin, which is the probability that a population, whose parameters are defined by the test data, will be within specified limits.

From the computer printout reports, it can be determined if the current hardware is performing as well as the assemblies did during R&D; also, performance can be compared with the last 25 assemblies tested.

If the reliability margin is the same or better, there is no problem indicated. If the reliability margin has decreased, it causes an "alert" for analysis by the contractor reliability and quality organizations to determine the cause.

If two consecutive test sets indicate a safety margin less than that achieved during R&D, the contractor must correct his problem and requalify through the same test method. He is required to produce an assembly with a reliability margin equal to or better than that demonstrated during R&D before any more lots can be accepted by quality control.

Quality control normally inspects or tests to assure that the item performs to specified requirements; overstress or life testing is required to assure the reliability level is met.

This method during the production cycle is thus seen as a positive method of controlling the reliability of the hardware going into the Lance system throughout its life.

While it is common practice to list a quantitative reliability requirement (and correct to do so) in procurement specifications, rarely is a reliability demonstration required to prove the requirement has been met. If there is a reliability requirement, it is normally demonstrated only once throughout all of production.

The reliability of the item may degrade with subsequent production and there is no way of determining the amount of degradation until the field failure reports start coming home.

Advantages of the "lance method" of reliability control include:

- The reliability of the item is checked throughout production.
- Failure modes and performance deterioration that might remain unobserved during quality control acceptance testing will become evident during overstress testing.

Flexible Parawing Developed for Pinpoint Accuracy

An all-flexible parawing aerial delivery system, capable of delivering high-priority cargo to remote or hostile areas with pinpoint accuracy, is being developed for the Army under contract with the U.S. Army Aviation Materiel Labs, Fort Eustis, Va.

Specifications require that the payloads may be released from 30,000-foot altitudes at distances up to 12 miles from the target and "home in" on ground-based radio beacons. The 220-square-foot canopy provides for a vertical descent rate of about 20 feet per second and a horizontal velocity about 60 feet per second.

Gliding capability of the parawing should enable the releasing aircraft to remain out of danger zones. The parawing should not reveal the location of the ground troops receiving the supplies as much as a low-level parachute drop from an aircraft.

Made of urethane-coated nylon, the parawing has a span of 25 feet and can be folded into a compact package of less than four cubic feet, including the guidance system. It can deliver cargo ranging from 100 to 500 pounds by day or night. The 80-pound system, which includes the use of catenary keel panels for lateral stability and a reduction in the number of rigging lines, is under development by the Goodyear Aerospace Corp.

Trends in Military Vehicle Electrical Generating Systems

By Alexander M. Karchon

In the past, electrical systems for Army ground vehicles have been considered near the terminal point of vehicle design. This is not surprising since the relatively small power requirements and general flexibility of electrical systems permitted delayed consideration.

For example, the electrical system concept for ground vehicles early during World War II was an adapted commercial automotive-electrical system with a power capacity of under one-kw. (Figure 1). However, system requirements advanced to 5-kw. by the end of the conflict.

Increased use of electrical power resulted in large electrical conductor cross-sections which made mandatory

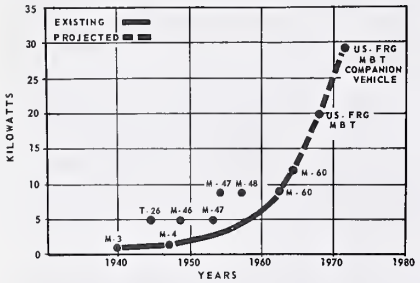

Fig. 1. Growing Electric Power

an increase in voltage to bring the condition under control. The 24-volt electrical system was adopted and became standard for vehicles.

This departure from commercial 6-volt automotive-electrical system concepts was given further impetus by environmental experience in World War II. Standard techniques were developed for suppressing radio interference and waterproofing electrical systems.

Radio interference suppression of electrical power generators evolved simply as a filter capacitor to ground for high-frequency components and reliance on the vehicle battery for filtering low-frequency noise.

Waterproofing of generators in wet engine compartments required considerable modification and redesign to obtain satisfactory units. The approach for a small unit (under one-kw.) differed from larger units. Dynamic parts in small power units were totally enclosed.

Total enclosure was possible by derating larger power units to under one-kw. This approach was not practical for units of over one-kw., and crew compartment air was ducted through the generator for cooling purposes.

Ducting of air, however, was more a compromise than an answer. Additional space was required for routing ducts through crowded engine compartments. Dirt and debris accumulated in ducts. An auxiliary fan was necessary to force cooling air through the ducts.

The ducted-air concept prevailed to about 10 years ago. Concepts then began to transform the ordinary image of the tank to a land-going vehicle with some water-fording capability, having a crew compartment directly accessible to the atmosphere. A new image of the tank began to emerge—crew encapsulation for extensive periods of time, swift mobility over land, capability for swimming and even complete submersion. Life-support systems depending on electrical power for this concept, it soon became apparent, would require durability and reliability. Increased power demands, and hence greater cooling, requirements, cast serious doubts on the use of air for cooling generators.

Consequently, a trapped coolant system was decided upon; to keep size to a minimum, engine oil was chosen to eliminate need of an auxiliary heat-rejection system.

To provide long life and reliability, contact between static and dynamic parts was kept to a minimum. The concept of a brushless generator with dynamic oil seals and oil-lubricated bearings was chosen.

After a study phase and several years of development, a nominal 20-kw., oil-cooled electrical generator was developed (Figure 2).

The system consists of a brushless, 3-phase synchronous alternator, an output rectifier assembly, a coolant-oil pump, and a transistorized voltage regulator.

A salient pole synchronous alternator, with wound rotor, is used in conjunction with an integrally-mounted exciter to produce an a-c output. The 3-phase exciter-output winding is mounted on the shaft with the main field winding.

Diodes rotating in the shaft rectify the exciter output and supply the main field with d-c power. The stationary 3-phase alternator output-winding supplies a-c to the power rectifier assembly. Voltage regulation is accomplished with field-current control of the stationary exciter field winding.

The a-c output of the alternator is supplied to the rectifier assembly. Mounted integrally with the machine, it consists of 24 diodes (240-ampere each) connected in four parallel, 3-phase, full-wave bridges.

Engine crankcase oil is used to cool the alternator windings and both rotating and stationary rectifiers. The same oil is used for bearing lubrication. An optional spur-gear type of rotary pump integrally mounted with the machine may be used to circulate coolant oil.

Requiring an inlet head of 1.5 inches of water, the pump supplies 3.5 gpm of 260-degrees fahrenheit oil through the machine at a pressure of

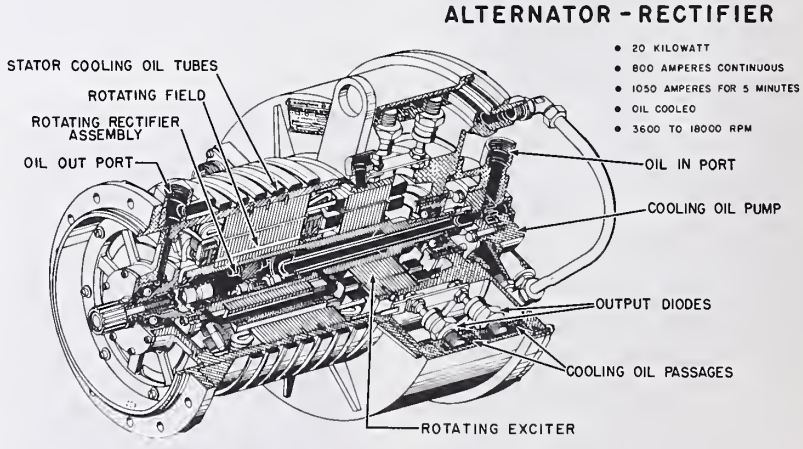

Fig. 2. 20-kw., oil-cooled, electrical generator.

Alexander M. Karchon is the project engineer in charge of vehicle electrical power generating systems at USATACOM. He taught courses in electrical engineering at Lawrence Institute of Technology subsequent to obtaining his degree from the University of Detroit. He has 20 years of experience in the electrical engineering field which includes 17 years with Department of Army.

180 psi at minimum speed (3,250 rpm). Internal pressure is regulated by sending back-pressure and by-passing oil directly to the crankcase.

Engine oil conforming to MIL–L–2104A, MIL–L–21260 or MIL–L–10295A may be used as the coolant medium. Oil received from the crankcase must be filtered to remove foreign particles in excess of 75 microns. Power dissipated to the oil does not exceed 8,000 watts under full load.

A low-powered local oscillator produces a saw-tooth wave form at a fixed frequency that is mixed with the output of the detector circuit. This composite signal is converted to a-pulse-width-modulated voltage of constant amplitude and fixed frequency. Voltage is amplified by a transistorized power amplifier and applied to the stationary exciter field of the machine.

The regulator is an all semiconductor device (no transformers or magnetic amplifiers). Transistors operate in the switching mode and the d-c voltage is maintained at 28 volts throughout the load and speed range. An adjustable current limit setting is from 700 to 850 amperes.

The alternator-rectifier combination is capable of delivering 800 amperes continuously or 1,050 amperes for five minutes at 28 volts d-c over an operating speed range of 3,250 to 18,000 rpm. Maximum inlet-oil temperature is limited to 260 degrees F. for satisfactory electrical insulation life at the previously specified loads.

The unit here described is aimed at the 1970 heavy-class vehicles using reciprocating type engines and is intended for mounting on the main engine. The current MBT–70 prototypes include this electrical generator as a component.

MICOM Awards $11 Million For Redeye Missile System

An $11,666,844 contract for production of Redeye air defense guided missile systems was awarded late in September by HQ U.S. Army Missile Command to the Pomona Division of General Dynamics Corp.

The fixed-price incentive contract supports the fifth industrial buy of complete Redeye weapon systems. Redeye is a shoulder-fired weapon that gives infantrymen an effective defense against low-flying enemy aircraft. It can be slung over the shoulder and carried anywhere a soldier can pack a rifle.

The Missile Command manages the Redeye program for both the Army and Marine Corps, who jointly funded weapon system development. Col J. R. M. Covert is project manager. Pomona Division of General- Dynamics is prime contractor.

ISF Winners Visit Army In-House Laboratories

TOP ARMY International Science Fair (ISF) winner, Don E. Baker, will represent the Army in January at the 1969 Japan Student Science Awards Exhibit in Tokyo, Japan. Shown at left, Baker studies operation of a fuze simulation on the analog computer at Picatinny Arsenal, Dover, N.J., where he spent three days in September visiting the Feltman Research Laboratories. Baker's project, "Irradiative Computer Component Microminiaturization," won him the $100 Association of the U.S. Army Award in addition to the "Operation Cherry Blossom" award and a visit to the laboratory of his choice. Baker has entered Rose Polytechnic Institute, Terre Haute, Ind., to study for an electrical engineering degree.

Kenneth L. Jones, one of the 10 19th International Science Fair (ISF) Army-selected superior award winners, enjoyed a one-week, all-expense-paid visit to Frankford (Philadelphia, Pa.) Arsenal as a guest of the Army. Shown with Dr. Sidney Ross, head of the Applied Science Laboratory, Jones views protective eye-gear used in laser research. Jones' award-winning report on his research project, "Development of a Two-Dimensional Ocean Wave Gauge for Surf Studies," aroused considerable interest at the U.S. Army Corps of Engineers' Coastal Engineering Research Center, Washington, D.C., which is involved in measurement and analysis of waves.

C. Dean Patrinely inspects a sensitive quartz thermometer at the U.S. Army Natick (Mass.) Laboratories, where he visited as part of his award at the ISF. Explaining the instrument is Dr. Arthur V. Dodd, a Natick staff research geographer. Patrinely's project, "Minimum Temperature Forecasting With a Parabolic Reflector," also won him a place as alternate delegate to represent the Army at the 1969 Japan Student Exhibit in Tokyo. He is a senior at Terry Parker High School in Jacksonville, Fla.

Wallace Head is welcomed to the Walter Reed Army Medical Center (WRAMC) by Brig Gen Frederic J. Hughes Jr., Walter Reed General Hospital commander. In addition to touring WRAMC activities, the young scientist gave a presentation on his ISF award-winning project, "The Effects of Tobacco on *Paramecium Caudatum*," to summer students who worked in laboratories at the Walter Reed Army Institute of Research. Lt Col Leslie B. Alstatt (right), assistant commandant at WRAIR, coordinated the visit.

Army Honors Annual Economy Champions for $9 Million Savings

In the U.S. Army's first annual Economy Champions Award ceremonies Sept. 24, a civilian whose idea saved $7.4 million and an officer-noncommissioned officer team whose suggestion saved $1.6 million in one year were honored for achievements.

Secretary of the Army Stanley R. Resor, before a large gathering of dignitaries of the Department of Defense and the Department of the Army, presented the Meritorious Civilian Service Award and $8,480 to Louis R. Wade for special achievements "far in excess of the normal requirements of his position."

Secretary Resor also honored Lt Col Dennis M. Boyle with a second Oak Leaf Cluster to the Army Commendation Medal and M/Sgt William A. Lilley with a first OLC to the ACM, along with a joint cash award of $2,745.

Through the efforts of Wade, an inventory management specialist at the U.S. Army Tank-Automotive Command, Warren, Mich., excess transmissions for early model tanks were refitted to a new configuration for M48 and M60 tanks, at a validated savings in new procurement of $7,426,947.

Assigned to the U.S. Army Aeronautical Depot Maintenance Center, Corpus Christi, Tex., Col Boyle and Sgt Lilley submitted an idea through the Army Suggestion Program which resulted in first-year measurable benefits to the Army of $1,690,894.

The suggestion provides for the fabrication of racks to mount the tailboom of the UH–1 helicopter on its cabin roof when being transported by airlift. This permits the loading of five aircraft instead of three in a C133 transport, reducing the number of required airlifts to and from Vietnam.

Louis R. Wade

The Army Roll of Economy Champions was established at the beginning of Fiscal Year 1968 by AR 672–20. The program was initiated to add impetus to incentive awards activities aimed at encouraging civilian and military personnel to find ways of doing their jobs more efficiently and at less cost.

SECRETARY OF THE ARMY Stanley R. Resor presents first annual Economy Champions Awards to Lt Col Dennis M. Boyle (left) and M/Sgt William A. Lilley. Also honored for special achievements far in excess of normal requirements of his position was Louis R. Wade (below, left).

SARS Fellowships Recognize Successes of 3 Employes

Dr. Frank D. Verderame

James W. Erwin

Frank R. Larson

Secretary of the Army Research and Study (SARS) Fellowships are providing one year of study to three Army employes, each selected for notable achievements and future potential for service to the Army in their respective fields.

DR. FRANK D. VERDERAME, a research chemist at the Pitman-Dunn Laboratories, Frankford (Philadelphia, Pa.) Arsenal, began studies recently at the University of Florence, Italy.

Under the mentorship of Prof. S. Califano of the Laboratory of Molecular Spectroscopy, Dr. Verderame is conducting research on the effects of crystal structure on the interaction of solids with light.

JAMES W. ERWIN is conducting a critical evaluation of *in-situ* determination of stress in rocks at the University of Arizona. He is conducting the research under direction of Dr. Williard C. Lacy, chairman of the Department of Geological Engineering.

Erwin received the fellowship for his work as chief of the Geology Section and assistant chief of the Foundations Branch, Corps of Engineers, Savannah (Ga.) District.

FRANK R. LARSON is studying at Brown University, Providence, R.I., under monitorship of Prof. D. Avery, Department of Engineering—Materials Science.

His research project involves the study of basic factors, such as alloying, working and phase transformation, which affect the development of crystallographic texture in hexagonal metals.

Larson is chief, Metals Laboratory, Army Materials and Mechanics Research Center, Watertown, Mass.

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